R E P O R T R E S U M E S

ED 016 844 08 VT 004 165

THE PREPARATION OF CURRICULUM MATERIALS AND THE DEVELOPMENT OF TEACHERS FOR AN EXPERIMENTAL APPLICATION OF THE CLUSTER CONCEPT OF VOCATIONAL EDUCATION AT THE SECONDARY SCHOOL LEVEL. VOLUME IV, INSTRUCTIONAL PLANS FOR THE ELECTRO-MECHANICAL CLUSTER.

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REPORT NUMBER BR-6-2312 PUB DATE AUG 67
GRANT OEG-2-7-062312-0175
EDRS PRICE MF-$0.50 HC-$5.08 125P.

DESCRIPTORS- *OCCUPATIONAL CLUSTERS, *ELECTRICAL OCCUPATIONS, *TEACHING GUIDES, *CURRICULUM GUIDES, *TRADE AND INDUSTRIAL EDUCATION, GRADE 11, GRADE 12,

DESIGNED FOR USE WITH 11TH AND 12TH GRADE STUDENTS, THIS CURRICULUM GUIDE FOR THE OCCUPATIONAL CLUSTER IN ELECTRO-MECHANICAL INSTALLATION AND REPAIR WAS DEVELOPED BY PARTICIPATING TEACHERS FROM RESULTS OF THE RESEARCH PROCEDURES DESCRIBED IN VOLUME I (VT 004 162). THE COURSE DESCRIPTIONS, NEED FOR THE COURSE, COURSE OBJECTIVES, PROCEDURES, AND INSTRUCTIONAL PLAN ARE DISCUSSED BRIEFLY. THE TASKS AND HUMAN REQUIREMENTS ARE ARRANGED IN AN INSTRUCTIONAL SEQUENCE FOR EACH OCCUPATION INCLUDED IN THE ELECTRO-MECHANICAL INSTALLATIONS AND REPAIR CLUSTER--AIR CONDITIONING AND REFRIGERATION SERVICING, BUSINESS MACHINE SERVICING, HOME APPLIANCE SERVICING, AND RADIO AND TELEVISION SERVICING. SUGGESTED TEACHING METHODS, INSTRUCTIONAL MATERIALS, STUDENT ACTIVITIES, AND EVALUATION PROCEDURES ARE ARRANGED IN COLUMNS OPPOSITE EACH AREA OF HUMAN REQUIREMENT. AN INSTRUCTIONAL MATERIALS LIST CONTAINS BOOKS, MANUALS, PAMPHLETS, FILMS, FILMSTRIPS, AND CHARTS. VOLUME II, INSTRUCTIONAL PLANS FOR THE CONSTRUCTION CLUSTER (VT 004 163) AND VOLUME III, INSTRUCTIONAL PLANS FOR THE METAL FORMING AND FABRICATION CLUSTER (VT 004 164) COVER THE OTHER TWO OCCUPATIONAL CLUSTERS THAT WERE DEVELOPED BY THE PROJECT. (MM)

ED016844

FINAL REPORT
(One of Four Volumes)
Project No. 6-2312
Grant No. OEG 2-7-062312-0175

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Volume IV

Instructional Plans for the Electro-Mechanical Installation and Repair Cluster

August 1967

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

VT004165

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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OEG 2-7-062312-0175

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The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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INTRODUCTION

The volume for the occupational cluster of electro-mechanical installation and repair is the result of the research procedures which are described in Part IV of the final report volume. The insturctional plans for the cluster were developed by the teachers participating in the program. Each teacher selected one of the occupations in the cluster and developed an instructional plan based on the tasks and areas of human requirement identified during the first phase of the project. The areas of human requirement are arranged in a suggested instructional sequence for each task in the occupation. The teaching methods, instructional materials, student acitivties, and methods of evaluation were then identified for each area of human requirement.

COURSE DESCRIPTION: The instructional plan for the occupation cluster of electro-mechanical installation and repair is designed to be used in a cluster concept program in vocational education at the secondary school level. The program is aimed at the development of skills and understandings related to a group of occupations within the electro-mechanical installation and repair cluster. It is not an in-depth development into any one occupation, but aims at preparing students to enter a number of occupations within the electro-mechanical installation and repair cluster.

NEED FOR THE COURSE: The course is designed to meet the needs of students pursuing a general curriculum in the secondary school system by providing job entry skills in a number of related occupations. It is also designed to meet the student's need for self appraisal of interests and potentialities in a number of occupations.

Specific needs include the following:

1. To provide students with the opportunity for a greater degree of mobility on a geographical basis.

2. To provide students with the opportunity for mobility within an industry or occupation.

3. To provide students with the opportunity for greater flexibility in occupational choice patterns.

COURSE OBJECTIVES: The course for the electro-mechanical installation and repair cluster will be directed toward the following objectives:

1. To broaden the student's knowledge of the available opportunities in occupations found in the electro-mechanical installation and repair cluster.

2. To develop job entry skills and knowledge for several occupations found in the electro-mechanical installation and repair cluster.

3. To develop a favorable attitude toward work in the electro-mechanical installation and repair cluster.

4. To develop a student's insight into the sources of information that will be helpful to him as he moves through the occupational areas.

The specific objectives for the course are the following:

1. To develop the student's competency in the use of common hand tools found in the electro-mechanical installation and repair cluster.

2. To develop the student's competency in using power tools and equipment needed for job entry into the occupations found in the electro-mechanical installation and repair cluster.

3. To develop the student's understanding of the operations, procedures, and processes associated with the electro-mechanical installation and repair cluster.

4. To develop safe working habits related to the occupations within the electro-mechanical installation and repair cluster.

5. To familiarize the student with the terminology associated with the electro-mechanical installation and repair cluster.

6. To develop an understanding of the resources available to him in his pursuit of the course as well as in his work following graduation.

PROCEDURE: It is recommended that the course be offered during the student's junior and senior year in high school. Instruction should be provided for two periods a day, five days a week, during the school year.

The most appropriate facility would be a self-contained laboratory unit containing the essential tools and equipment necessary for teaching job entry tasks in the electro-mechanical installation and repair cluster.

The instructor should be a person with some experience and competence in the occupations included in the cluster. The course should be organized by the teacher on a multiple activity basis with groups of students rotating through the specific occupational areas. The common areas of human requirement needed to perform the tasks in the cluster should be emphasized sc that an opportunity is provided for the students to transfer the common skill or knowledge from one occupation to another.

The possibility of team teaching procedures would be appropriate for the electro-mechanical installation and repair cluster. Specialists in different occupational areas would participate in the instructional program. The team teachers could be other vocational teachers as well as competent individuals from the community.

The instructor of the course should coordinate his program with other teachers in the school to develop the competencies in mathematics, science, and communication that will be needed for successful performance

in the occupations found in the electro-mechanical installation and repair cluster. Community resources, such as local industries, employment agencies, and tradesmen should be utilized to provide occupational information and knowledge needed concerning the performance of the tasks in the electro-mechanical installation and repair occupations.

INSTRUCTIONAL PLANS: The following section of the volume presents the instructional plan for the electro-mechanical installation and repair cluster. The tasks and areas of human requirement are arranged in an instructional sequence for each occupation. Suggested teaching methods, instructional materials, student acitvities, and evaluation procedures are found opposite each area of human requirement. Instructional plans for occupational information are found at the end of each occupation. The plan sheets in the volume provide teachers with the information needed to implement an electro-mechanical installation and repair cluster concept program at the secondary school level.

AIR CONDITIONING AND REFRIGERATION SERVICING

TASK NO. 1: INSTALLING TUBING BETWEEN CASE AND CONDENSING UNIT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks for: (a) Installation procedures and techniques. (b) Service procedures. (c) Type, function and rating of defective part. (d) Electrical supplies. (e) Repair and replacement of components. (f) Special service tools. (g) Electrical codes.	Demonstration. Lecture. Practical work. Self study. Programmed instruction Film.	Drawings, specifications, catalogues, manuals, schematics, handbooks, textbooks and code. Assortment of components, i.e., tubing. Special tool kit (service). Common hand tools and measuring devices. Film: "Making and Repairing Tubing Connections," 18 min., sd., b & w, Order No. OE452, buy from United World Films, Inc., 1445 Park Ave., New York 29, N.Y.	A. Listening to explanation. B. Reading drawings, specifications, catalogues, manuals, schematics, and handbooks. C. Identifying components from drawings. D. Listing and defining new terms. E. Identifying special tools. F. Writing specifications for defective parts. G. Listening to film.	A. Written or oral quiz. B. Written quiz. C. Observation by teacher. D. Observe and demand the use of new terms. E. Oral explanation of name and purpose of special tools. F. Order a replacement part from manufacturer's catalogue. G. Written test on film.
Interpreting instructions and information located on the data plate of the unit.	Explanation. Lecture.	Data plates.	Reading data plate and following instructions.	Check sheet as to accuracy of interpretation.
Measuring the inside diameter and outside diameter of tubing with calipers and rule. Measuring the length of tubing with steel tape to accuracy of 1/16 of an inch. Adding numbers and fractions to determine total length of tubing.	Demonstration. Practical work.	Tubing of assorted length. Diameter. Calipers - ID, OD. Steel tape. Steel rule.	Measuring each sample item to determine length, I.D., O.D.	Check sheet against known values.
Cutting tubing to specific length with tubing cutter.	Demonstration. Practical work.	Assorted tubing. Tubing cutter. Rule. Steel tape. Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist.	Cutting tubing with tubing cutter.	Check accuracy of cut according to specified length.
Explaining how to make allowances by bonds. Bending tubing with a machine and spring to fit the unit.	Demonstration. Practical work.	Tubing. Bonding machine. Bending spring.	Bonding tubing with a machine and spring to fit the unit.	Check the bend against the specifications.
Reaming tubing to remove inside burr with hand reamer. Selecting the proper type and size of reamer for the job to be done.	Demonstration. Practical work.	Tubing. Hand reamer.	Reaming tubing with hand reamer.	Inspect the tubing with burr removal.
Flaring tubing with flaring tool to insure proper seal.	Explanation. Practical work.	Flaring tool. Tubing.	Flaring tubing with a flaring tool.	Test for proper seal on operating unit.

Task I (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Cleaning tubing with a brassive cloth for soldering to remove corrosion. Practicing safety precautions when soldering. Selecting the proper type of fluxes and solders for their respective uses. Soldering tubing with soft or silver solder with a torch.	Demonstration. Practical work. Films.	Solder: soft. silver. fluxes. Torch, propane. Abrasive cloth. Tubing, copper. Films: "Hand Soldering," 20 min., sd., b & w. "Tinning and Solder Wiping," 26 min., sd., b & w, both films bought from United World Films, Inc., 1445 Park Ave., New York 29, N.Y.	Safely cleaning and soldering copper tubing. Tubing.	Quiz on films. Inspection of student work.
Explaining the physical properties of copper when being worked or exposed to the elements.	Demonstration.	Copper tubing. Corrosive acid. Ammonia. Sulphur dioxide.	Observing demonstration.	Written or oral quiz.

TASK 2: TESTING LINES WITH DETECTION DEVICE FOR LEAKS

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals. 1. Installation procedures and techniques. 2. Service Procedures. 3. Type, function and rating of defective part. 4. Electrical Supplies. 5. Repair and Replacement of Components. 6. Special Service Tools. 7. Electrical Codes.	Demonstration. Lecture. Practical work. Film. Self study.	Drawings, specifications,catalogues, manuals, schematics, handbooks, text books and code. Assortment of components, i.e., tubing. Special tool kit (service) Common hand tools and measuring devices. Film: "Making & Repairing Tubing Connections," 18 min, sd, b & w, Order No. OE452, buy from United World Films, Inc., 1445 Park Ave., New York 29, N.Y.	A. Listening to explanation. B. Reading drawings, specifications, catalogues, manuals, schematics and handbooks. C. Identifying components from drawings. D. Listing and defining new terms. E. Identifying special tools. F. Writing specifications for defective parts. G. Listening to film.	A. Written or oral quiz. B. Writter quiz. C. Observation by teacher. D. Observe and demand the use of new terms. E. Oral explaination of name and purpose of special tools.
Interpreting instructions from data plate of the unit.	Explanation. Lecture.	Data plates.		
Explaining the chemistry of refrigerants and their reaction in contact with other materials.	Demonstration. Lecture. Film.	Ammonia. Water. Freon - 12. Sulphur dioxide. Methyl chloride. Copper tubing. Aluminum tubing. Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist, Chapter 11. Film: "Locating and Repairing Leaks," 17 min., sd., b & w, United World Films, Inc., 1445 Park Avenue, New York 29, N.Y., buy from United World Films.	Listening to film. Watching demonstration. Reading text on refrigerants.	Quiz on film and text.
Recognizing the different types of refrigerants.	Demonstration. Lecture.	Ammonia. Freon 12 - 22. Sulphur dioxide. Methyl chloride.	Comparing the characteristics of the different refrigerants.	Written quiz to determine students ability to recognize different refrigerants by sight, smell, or feel (use sample of each).
Demonstrating proper safety precautions when testing for refrigerant leaks in enclosed spaces.	Demonstration. Lecture.	Safety equipment: gloves and apron. goggles. shoes.	Observing demonstration.	Observation for safe practices by students.
Practicing safety procedures when handling refrigerants.	Demonstration. Practical work.	Safety equipment: gloves and apron. goggles. shoes.	Observing safety regulations when handling refrigerants.	Quiz on safety precautions. Observation as to practice.
Selecting the proper type of refrigerant according to specifications.	Practical work.	Refrigerants. Data plates.	Reading data plate on the unit. Making selection from stock.	Check for correct refrigerant for the unit according to the data plate.

Task 2 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Regulating the pressure on a halide leak detector.	Practical work.	Halide leak detector.	Regulating the pressure on a halide leak detector.	Observe correct flame form.
Applying the proper procedures when using the halide leak detector.	Demonstration. Lecture. Practical work.	Halide Leak detector. Air conditioning unit. Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist, p. 282; p. 479.	Testing a unit for leaks with a halide leak detector.	Observe use of halide leak detector.
Applying the proper procedures when using an electronic leak detector.	Demonstration. Lecture. Practical work.	Electronic leak detector. Refrigerator unit. Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist, p. 283; p. 479.	Testing for leaks in a unit with an electronic leak detector.	Observe use of an electronic leak detector.
Applying the proper procedures when checking for refrigerant leaks when using: (a) Soap test. (b) Litmus paper. (c) Sulphur stick.	Demonstration. Lecture. Practical work.	Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist, p. 28. Residential and Commercial Air Conditioning by Burkhardt, pp. 252-4.	Testing for refrigerant leaks with: (a) soap. (b) litmus paper. (c) sulphur stick. Reading assigned text and reference material.	Performance test by student.

TASK NO. 3 Installing Gages on Condenser to Charge the Unit With Refrigerant

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks for: (a) Installation procedures & techniques. (b) Service procedures. (c) Type, function and rating of defective part. (d) Electrical supplies. (e) Repair and replacement of components. (f) Special service tools. (g) Electrical codes.	Demonstration. Lecture. Practical work. Self study. Programmed instruction. Film.	Drawings, specifications, catalogues, manuals, schematics, handbooks, textbooks and code. Assortment of components, i.e., tubing. Special tool kit (service). Common hand tools and measuring devices. Film: "Making and Repairing Tubing Connections," 18 min, sd., b & w, Order No. OE 452, United World Films, Inc., 1445 Park Ave., New York 29, N.Y.	A. Listening to explanation. B. Reading drawings, specs, catalogues, manuals, schematics and handbooks. C. Identifying components from drawings. D. Listing and defining new terms. E. Identifying special tools. F. Writing specifications for defective parts. G. Listening to film.	A. Written or oral quiz. B. Written quiz. C. Observation by teacher. D. Observe and demand the use of new terms. E. Oral explanation of name and purpose of special tools. F. Order a replacement part from manufacturer's catalogue. G. Written test on film.
Interpreting instructions and information located on the data plate of the unit.	Explanation Lecture.	Data plates.	Reading data plate and following instructions.	Check sheet as to accuracy of interpretation.
Interpreting gages to determine the depth and duration of vacuum as indicated in specifications.	Demonstration. Lecture. Practical work.	Vacuum gages. Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist, pp. 260-267.	Reading gages and making comparisons on chart of known values.	Check list of known values against computed values.
Converting gage pressure to absolute, inches or millimeters of mercury.	Practical work.	Student work sheet. Textbook: Modern Refrigeration Air Conditioning by Althouse and Turnquist, pp. 15-30.	Working with conversion tables and formulas.	Written evaluation sheet.
Demonstrating the proper procedures when connecting a service gage manifold when charging refrigerator system.	Demonstration. Practical work.	Service gage manifold. Refrigerator unit.	Installing the service gage manifold on the unit.	Visual check for proper connection.
Recognizing the various types of gages.	Demonstration. Practical work.	Various gages.	Examining gages of various types to determine the difference.	Test students ability to recognize different types of gages.
Recognizing types and use of manometers.	Demonstration. Practical work.	Various manometers.	Examination of manometers by students.	Written examination.
Recognizing types and use of wet wick vacuum indicators.	Demonstration. Practical work.	Wet wick vacuum indicators.	Working with wet wick vacuum indicators.	Written examination.
Recognizing necessary care when using vacuum indicators.	Demonstration. Lecture.	Textbook: Modern Refrigeration and Air Conditioning, by Althouse and Turnquist, pp. 47-49.	Following lecture in text. Reading reference material.	Written examination on text material.

Task 3 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the results of excessive pressures in the refrigerator system.	Lecture. Student work sheets.	Work sheets.	Group discussion.	Written quiz.
Applying the proper care, maintenance and storage of instruments.	Demonstration.	Complete set of all air conditioning tools and equipment.	Watch demonstration.	Observation of proper handling of instruments by students.

TASK 4: EVACUATING ENTRIE SYSTEM WITH VACUUM PUMP TO REMOVE ALL NON-CONDENSABLES

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Explaining the process using a vacuum pump connected to refrigerant compressor to draw a vacuum in the system.	Demonstration. Lecture.	Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist, pp. 278-280.	Following demonstration. Read text.	Written quiz.
Demonstrating the procedure of using vacuum pumps to evacuate the system.	Demonstration.	Vacuum pump. Refrigeration unit.	Following demonstration. Evacuate a system.	Test students ability to evacuate a system using a vacuum pump.
Explaining the efforts of moisture in the system.	Lecture or job sheet.	Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist, pp. 278-280.	Following lecture, read text. Working from job sheet.	Written quiz.
Explaining the effects of non-condensable gasses in the system.	Lecture or job sheet.	Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist, pp. 278-280.	Following lecture in text. Working from job sheet.	Written quiz.
Explaining the process of changing a liquid to a gas.	Demonstration. Lecture. Filmstrip.	Hot plate and water. Filmstrip: "Basic Principles of Refrigeration," 71 ft., b & w, with record, #F.21-a, borrow from U.S. Public Health Service Communicable Disease Ctr., Atlanta 22, Ga.	Evaporating water. Listening to filmstrip. Following lecture.	Quiz on demonstration and filmstrip.
Reading instruments (gages) to determine desired vacuum.	Practical work. Job sheet.	Gages. Refrigerator unit. Vacuum pump.	Reading instruments and determining vacuum.	Check answers on job sheet.
Interpreting gages to determine the depth and duration of vacuum as indicated in specifications.	Demonstration. Lecture. Practical work.	Vacuum gages. Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist, pp. 15-30.	Working with conversion tables and formulas	Written evaluation sheet
Measuring refrigerant in system with a pressure gage.	Demonstration. Practical work.	System unit. Pressure gage.	Measuring refrigerant with gages.	Observe students.
Converting inches of vacuum to percent of air.	Informational sheet. Job sheet.	Informational sheet. Job sheet.	Making mathematical calculations to connect inches of vacuum to percentage air.	Answer sheet. Written quiz.

Task 4 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Caring for various types of vacuum pumps. Applying the proper care, maintenance, and storage.	Informational sheet.	Informational sheet. Textbook: Modern Refrigeration and Air Conditiong by Althouse and Turnquist, pp. 396-399.	Maintaining vacuum pumps.	Operational check.
Explaining the effects of mercury in the system.	Informational sheet. Lecture.	Informational sheet.	Working from information sheet. Following the lecture.	Written quiz.
Applying the proper care, maintenance of storage of vacuum indicators.	Demonstration. Practical work.	Vacuum indicators.	Maintaining vacuum indicators.	Operational check of equipment

TASK 5: REMOVING COVER FROM THE UNIT FOR EASE OF SERVICING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks for: (a) Installation proceudres and techniques. (b) Service procedures. (c) Type, function and rating of defective part. (d) Electrical supplies. (e) Repair and replacement of components. (f) Special service tools. (g) Electrical codes.	Demonstration. Lecture. Practical work. Self study. Programmed instructions. Film.	Drawings, specifications, catalogues, manuals, schematics, handbooks, textbook and code. Assortment of components, i.e., tubing. Special tool kit (service). Common hand tools and measuring devices. Film: "Making and Repairing Tubing Connections," 18 min., sd., b & w, Order No. OE 452, buy from United World Films, Inc., 1445 Park Ave., New York 29, N.Y.	A. Listening to explanation B. Reading drawings, specs, catalogues, manuals, schematics and handbooks C. Identifying components from drawings D. Listing and defining new terms E. Identifying special tools F. Writing specifications for defective parts G. Listening to film	A. Written or oral quiz B. Written quiz C. Observation by teacher D. Observe and demand the use of new terms E. Oral explanation of name and purpose of special tools F. Order a replacement part from manufacturer's catalogue G. Written test on film
Selecting the proper type and size of: (a) Screwdrivers. (b) Pliers. (c) Wrenches. (d) Nutdrivers.	Demonstration. Practical work.	A. Screwdrivers: phillips. read-prince-straight. electricians. B. Pliers: slip joint. needle nose-diagonal. side-cutter. C. Wrenches: open end. box end. socket. D. Nutdrivers.	Examining different types of screwdrivers: Pliers Wrenches Nutdrivers Properly applying the tools for the purpose for which they were intended.	Correct usage of tools (observation).
Applying the proper care, maintenance and storage of tools.	Demonstration. Practical work.	Tools - entire set.	Maintaining tools in a working condition.	Inspection of care, maintenance, storage and tools.
Recognizing the proper methods of holding wrenches.	Demonstration. Practical work.	Assorted hand tools: screwdrivers. pliers. wrenches. nutdrivers.	Holding, handling and using tools correctly.	Observation of student at work.
Applying the proper methods of holding the work.	Demonstration. Practical work.	Holding devices: clamps. vices.	Securing work for safe operations.	Demonstration by student on holding work.
Applying methods of holding pliers for pulling, pressing, and twisting.	Demonstration.	Pliers.	Twisting, pulling, and pressing with pliers.	Observation of student.

Task 5 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the results of using pliers for removing nuts and bolts.	Demonstration.	Pliers. Nuts. Bolts. Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist, p. 56 (2-39).	Student removing nuts and bolts with pliers.	Student write his observation of this practice.
Recognizing the various types of fastening devices.	Demonstration. Display.	Assortment of fastening devices.	Handling and using fastening devices.	Student can identify and use different types of fastening devices.
Recognizing the various types, uses and characteristics of threaded fasteners.	Demonstration. Display.	Assortment of threaded fasteners.	Working with threaded fasteners.	Student will correctly use threaded fasteners.
Recognizing the various types and uses of washers.	Demonstration. Display.	Assortment of washers.	Students determining the correct usage of washers.	Proper application of washers.
Applying the proper method of removing threaded fasteners.	Demonstration. Practical work.	Tools: Wrenches. Nutdrivers. Refrigeration units.	Removing threaded fasteners to disassemble the unit.	Observe the correct usage of tools. Threaded fasteners not damaged.
Recognizing the difference between right and left hand threads.	Demonstration. Practical work.	Examples of: Right hand threads, bolt and nut. Left hand threads, bolt and nut. Thread charts.	Examining left hand and right hand bolts and nuts. Working with left hand and right hand threads.	Student will be able to recognize the different types of threads.

TASK 6: REPLACING THE DEFECTIVE COMPONENT (S) IN THE REFRIGERATION UNIT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks for: (a) Installation procedures & techniques (b) Service procedures (c) Type, function & rating of defective part (d) Electrical supplies (e) Repair and replacement of components (f) Special service tools (g) Electrical codes.	Demonstration. Lecture. Self study. Programmed instruction. Film.	Drawings, specifications, catalogues, manuals, schematics, handbooks, textbooks and code. Assortment of components, i.e., tubing. Special tool kit (service). Common hand tools and measuring devices. Film: "Making and Repairing Tubing Connections," 18 min., sd., b & w., Order No. 452, buy from United World Films, Inc., 1445 Park Ave., New York 29, N.Y.	A. Listening to explanation B. Reading drawings, specs, catalogues, manuals, schematics and handbooks C. Identifying components from drawings D. Listing and defining new terms E. Identifying special tools F. Writing specifications for defective parts G. Listening to film.	A. Written or oral quiz B. Written quiz C. Observation by teacher D. Observe and demand the use of new terms E. Oral explanation of name and purpose of special tools F. Order a replacement part from manufacturer's catalogue G. Written test on film.
Measuring the inside diameter and outside diameter of tubing with calipers and rule. Measuring the length of tubing with steel tape to accuracy of 1/16 of an inch. Adding numbers and fractions to determine total length of tubing.	Demonstration. Lecture. Practical work.	Tubing of assorted length: Diameter. Calipers - ID. OD. Steel tape. Steel rule.	Measuring each sample item to determine length, I.D. and O.D.	Check Sheet against known values.
Measuring refrigerant in the system.	Demonstration. Practical work.	System unit. Pressure gage.	Measuring Refrigerant With Gauges.	Observe Students.
Recognizing the properties of non-ferrous metals when making solderless connections.	Demonstration. Lecture. Practical work.	Tubing: Copper Aluminum Flare connectors.	Making solderless connections in non-ferrous metal tubing.	Test connections for leaks under 150 psi compressed air.
Selecting the proper type of solder recommended for refrigeration sweated joints.	Lecture. Display.	Solder: Soft Silver, 1,2,3 Torch Flux Copper tubing	Making soldered connections in copper tubing.	Test connections for leaks under 150 psi compressed air.
Demonstrating the proper techniques of using a torch for soldering and un-soldering joints.	Demonstration. Practical work.	Torch. Solder Soft Silver Flux Brush Tubing	Making solder joints in tubing. Unsoldering joints with a torch.	Observe students making solder joints. Observe students un-soldering joints.

Task 6 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Cutting tubing to specific lengths with tube cutter. Applying proper care, maintenance, and storage of tube cutters.	Demonstration. Practical work.	Assorted tubing. Tubing cutter. Rule. Steel tape. Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist.	Cutting tubing with tubing cutter	Check accuracy of cut according to specified length
Selecting the proper type and size of reamer for the job to be done.	Demonstration Practical work	tubing hand reamer	Reaming tubing with hand reamer	The tubing with burr removed. Inspect
Removing tubing to remove inside burr with hand reamer.	Demonstration. Practical work.	Tubing. Hand reamer.	Reaming tubing with Hand Reamer	Inspect the tubing with burr removed
Flaring tubing with flaring tool to insure proper seal.	Explanation. Practical work.	Flaring tool. Tubing.	Flaring tubing with a flaring tool	Test for proper seal on operating unit
Charging the refrigeration system with the specified refrigerant.	Demonstration. Practical exercise.	Vacuum pump. Gages. Refrigerants. Refrigeration unit.	Evacuating the system with vacuum pump. Installing gage manifold. Charging system with refrigerant.	Observe the operation of the charged unit. Test for leaks.
Selecting the proper type and size of: (a) screwdrivers (b) pliers (c) wrenches (d) cutters (e) levels (nutdrivers)	Demonstration. Practical work.	Screwdrivers phillips reed-prince straight electricians Pliers slip joint needle nose diagonal side cutter Wrenches open end box end socket Nutdrivers	Examining different types of screwdrivers " pliers " wrenches " nutdrivers Properly applying the tools for the purpose for which they were intended	Correct usage of tools (observation)

Task 6 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Replacing the defective components with the appropriate tools.	Work. Study.	Assortment of refrigeration components. Hand tools: Screwdrivers phillips reed-prince straight electricians Pliers slip joint needle nose diagonal side cutter Wrenches open end box end socket Nutdrivers	Examining different types of screwdrivers " pliers " wrenches " nutdrivers Properly applying the tools for the purpose for which they were intended.	Correct usage of tools (observation).
Applying the proper care, maintenance and storage of tools.	Demonstration. Practical work.	Tools: Entire set	Maintaining tools in a working condition.	Inspection of care, maintenance and storage of tools.
Recognizing the results of using pliers for removing nuts and bolts.	Demonstration.	Pliers. Nuts. Bolts. Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist, p. 56 (2-39).	Holding, handling and using the tools correctly.	By observing students at work.
Applying methods of holding pliers for pulling, pressing, and twisting.	Demonstration.	Pliers.	Securing work for safe operations.	Demonstration by student on holding work.
Applying methods of holding pliers for pulling, pressing and twisting.	Demonstration. Practical work.	Pliers.	Twisting, pulling and pressing with pliers.	Observation of student.
Recognizing the results of using pliers for removing nuts and bolts.	Demonstration.	Pliers. Nuts. Bolts. Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist, p. 56 (2-39).	Student removing nuts and bolts with pliers.	Student write his observation of this practice.
Determining the proper methods of stripping wire.	Demonstration. Practical work.	Wire: solid stranded Knife. Wire stripper	Removing insulation from wire to make electrical connections.	Inspection of connection.
Recognizing the various types of fastening devices.	Demonstration. Display.	Assortment of fastening devices.	Handling and using fastening devices.	Student can identify and use different types of fastening devices.

Task 1 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the various types, uses, and characteristics of threaded fasteners.	Demonstration. Display.	Assortment of threaded fasteners.	Working with threaded fasteners	Student will correctly use threaded fasteners
Recognizing the various types and uses of washers.	Demonstration. Display.	Assortment of washers.	Student determining the correct usage of washers	Proper application of washers
Applying the proper methods of installing threaded fasteners.	Demonstration. Lecture. Practical work.	Wrenches. Screwdrivers. Nutdrivers. Fastening devices (threaded).	Installing threaded fasteners with the appropriate tools Watch demonstration	Observe installation procedures
Recognizing the difference between right and left hand threads.	Demonstration. Practical work.	Examples of: Right hand threads Bolts and nuts Left hand threads Bolts and nuts Thread charts.	Examining LH and RH bolts and nuts Working with LH and RH threads	Student will be able to recognize the different types of threads

TASK 7: REPLACING COVER ON UNIT TO RESTORE TO ORIGINAL CONDITION

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks for: a. Installation procedures and techniques. b. Service procedures. c. Type, function and rating of defective part. d. Electrical supplies. e. Repair and replacement of components. f. Special service tools. g. Electrical codes.	Demonstration. Lecture. Practical work. Film. Self study. Programmed instruction.	Drawings, specifications, catalogues, manuals, schematics, handbooks, textbooks and code. Assortment of components, i.e. tubing. Special tool kit (service). Common handtools and measuring devices Film: "Making and Repairing Tubing Connections," 18 min., sd., b & w, buy from United World Films, Inc., 1445 Park Avenue, N.Y. 29, N.Y.	A. Listening to explanation B. Reading drawings, specs, catalogues, manuals, schematics and handbooks C. Identifying components from drawings D. Listing and defining new terms E. Identifying special tools F. Writing specifications for defective parts G. Listening to film.	A. Written or oral quiz B. Written quiz C. Observation by teacher D. Observe and demand the use of new terms E. Oral explanation of name and purpose of special tools F. Or[illegible] a replacement part from [illegible]facturers' catalogue G. [illegible]n test on film
Selecting the proper type and size of: (a) Screwdrivers (b) Pliers (c) Wrenches (d) Nutdrivers	Demonstration. Practical work.	Screwdrivers: phillips reed-prince straight electricians Pliers: slip joint needle nose diagonal side cutter Wrenches: open end box end socket Nutdrivers	Examining different types of: Screwdrivers. Pliers. Wrenches. Nutdrivers. Properly applying the tools for the purpose for which they were intended.	Correct usage of tools (observation).
Replacing cover plates using appropriate tools.	Demonstration. Practical work.	Tools: screwdrivers pliers wrenches cutters nutdrivers levels Cover plates Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist, chapter 2.	Installing cover plates on the unit to restore original condition.	Inspection of unit to observe the correct usage of tools, correct assemly and a functional end item.
[illegible]plying the proper care, maintenance and storage of tools.	Demonstration. Practical work.	Tools: entire set.	Maintaining tools in working condition	Inspection of care, maintenance a[illegible] storage of tools

Task 7 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the proper methods of holding wrenches.	Demonstration. Practical work.	Assortment of hand tools: screwdrivers pliers wrenches nutdrivers	Holding, handling and using tools correctly.	By observing students at work.
Applying the proper methods of holding the work.	Demonstration. Practical work.	Holding devices: clamps vices	Securing work for safe operations.	Demonstration by student on holding work.
Applying methods of holding pliers for pulling, pressing and twisting.	Demonstration.	Pliers.	Twisting, pulling and pressing with pliers.	Observation of student.
Recognizing the results of using pliers for removing nuts and bolts.	Demonstration.	Pliers. Nuts. Bolts. Textbook: Modern Refrigeration and Air Conditioning, Althouse and Turnquist, p. 56 (2-39).	Student removing nuts and bolts with pliers.	Student write his observation of this practice.
Applying the proper procedures for cutting with diagonal cutters.	Demonstration. Practical work.	Wire: solid stranded Diagonal cutters. Textbook: Modern Refrigeration and Air Conditioning by Althouse and Turnquist, chapter 2.	Cutting wire with diagonal cutters.	Observe cutting operations.
Determining the proper methods of stripping wire.	Demonstration. Practical work.	Wire: solid stranded Knife. Wire stripper	Removing insulation from wire to make electrical connections.	Inspection of connection.
Recognizing the various types of fastening devices.	Demonstration. Display.	Assortment of fastening devices.	Handling and using fastening devices.	Student can identify and use different types of fastening devices.
Recognizing the various types, uses, and characteristics of threaded fasteners.	Demonstration. Display.	Assortment of threaded fasteners.	Working with threaded fasteners.	Student will correctly use threaded fasteners.

Task 7 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the various types and uses of washers.	Demonstration. Display.	Assortment of washers.	Student determining the correct usage of washers	Proper application of washers
Applying the proper methods of installing threaded fasteners.	Demonstration. Lecture. Practical work.	Wrenches. Screwdrivers. Nutdrivers. Fastening devices (threaded).	Student determining the correct usage of washers	Proper application of washers
Recognizing the difference between right and left hand threads.	Demonstration. Practical work.	Examples of: Right hand threads Bolts and nuts Left hand threads Bolts and nuts Thread charts.	Examining left hand and right hand bolts and nuts. Working with left hand and right hand threads.	Student will be able to recognize the different types of threads.

OCCUPATIONAL INFORMATION FOR AIR CONDITIONING AND REFRIGERATION SERVICING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Employment outlook: 1. Local 2. National	Lecture - guest speaker from local employment security agency. Demonstration chart.	Speaker. Informational sheets. Publication: Occupational Outlook Handbook, U.S. Department of Labor, 1966-67 edition, Washington, D.C.: Government Printing Office, 1966. Bulletin #1450-3, U.S. Department of Labor. Flip charts.	Listening to speaker. Making notes on: Number employed Employment outlook Wage rates Job requirements	Discussion. Written quiz on employment security office. Employment trends (local and national); requirements (physical, mental); characteristics of work.
Wage scales: 1. Local a. union (1) apprentice (2) journeyman (3) masters b. non-union (1) entry wages (2) experienced 2. National a. union (1) apprentice (2) journeyman (3) masters b. non-union (1) entry wages (2) experienced	Lecture. Demonstration. Guest speaker from local union.	Transparencies to dramatize differences between union and non-union wages on the local level.	Listen to speaker. Watch and interpret transparencies. Make notes on all phases of instruction.	Check the familiarity of the student with the wage scales of both union/non-union on the local and national level.
Types of training available: 1. Apprenticeship programs 2. Technical trade schools 3. On-the-job 4. Military	Lecture. Film. Speaker Local recruiter.	Contact area appliance dealers. Film: "Buck County Vocational-Technical Center," Williamsport, Pa. Speaker. Teacher-prepared information sheets.	Listen to speaker. Watch film. Writing for information from appliance dealers and trade schools.	Observation and discussion.
The working conditions experienced in the occupation.	Lecture - and/or guest speaker from service shop.	Publication: Occupational Outlook Handbook, U.S. Department of Labor, 1966-67 edition, Washington, D.C.: Government Printing Office, 1966. Bulletin #1450-3, Department of Labor. Local service shop.	Students will follow speaker/teacher and take notes.	Class discussion.
The physical and mental characteristics needed for qualifications for employment.	Lecture - and/or guidance counselor.	Publication: Occupational Outlook Handbook, U.S. Department of Labor, 1966-67 edition, Washington, D.C.: Bulletin #1450-3, Department of Labor.	Listen to lecture and take notes.	Oral discussion.

OCCUPATIONAL INFORMATION UNIT FOR AIR CONDITIONING AND REFRIGERATION SERVICING (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Geographical location of employmen	Lecture. Demonstration.	Publication: Occupational Outlook Handbook, U.S. Department of Labor, 1966-67 edition, Washington, D.C.: Government Printing Office, 1966. Bulletin #1450-3, Department of Labor. Transparencies.	Listen to lecture and take notes.	Oral discussion.
The opportunities for advancement: Advantages and disadvantages of the occupation. The nature of the work involved in the occupation.	Lecture by local serviceman.	Publication: Occupational Outlook Handbook, U.S. Department of Labor, 1966-67 edition, Washington, D.C.: Government Printing Office, 1966. Bulletin #1450-3, Department of Labor.	Listen to lecture and take notes.	Class discussion.
The union involvement in the occupation.	Lecture. Local union representative and/or teacher-led discussion.	Publication: Occupational Outlook Handbook, U.S. Department of Labor, 1966-67 edition, Washington, D.C.: Government Printing Office, 1966. Bulletin #1450-3.	Listen to lecture and take notes.	Oral discussion.

BUSINESS MACHINE SERVICING

TASK NO. I OBSERVING THE SYMPTOMS TO DETERMINE THE DEFECTS OF A TYPEWRITER

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Determine the defects of a typewriter by: (a) Discussion with the operator.	Instruct the students on methods of questioning. Use of local service man if possible. Teacher prepared tapes on customer complaints.	Typewriters. Typewriter trouble shooters manual. and service repair manual. Tapes - teacher prepared.	Create a situation so that the student can have the opportunity to question the operator. Listen to tapes.	Visual. Written examination. Oral.
(b) Observation of the operation of the typewriter.	Instruct the students on methods of observation.	Typewriters. Typewriter trouble shooters manual and service repair manual. Tapes - teacher prepared.	Create a situation so that the student can have the opportunity to observe the operation of the typewriter.	Visual. Written examination. Oral.
(c) Operation of the machine.	Instruct the students on the methods of operation of the typewriter.	Typewriters. Typewriter trouble shooters manual. and service repair manual. Tapes - teacher prepared.	Create a situation so that the student can operate the typewriter.	Visual. Written examination. Oral.

TASK NO. 2 DISSEMBLING THE TYPEWRITER FOR CLEANING BY REMOVING THE PARTS THAT MAY BE AFFECTED BY THE CLEANING SOLVENT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Remove the ribbon. Remove the platen. Remove the feed rolls. Remove the rubber feet. Remove all other rubber or other fabric parts that may be affected by the solvent. Remove the carriage assembly. Remove all side and cover plates. Remove all electrical components and connections.	Demonstration and use of tapes.	Service repair manual. Tools. Tapes - teacher made. Assembled typewriters for each student.	Listening and observing demonstration. Listening to tapes and responding on typewriters by: Removing the platen. Removing the feed rolls. Removing the rubber feet. Removing all other rubber or other fabric parts that may be affected by the solvent. Removing the carriage assembly. Removing all side and cover plates. Removing all electrical components and connections.	Visual. Written examination. Oral.

TASK NO. 3 CLEANING THE TYPEWRITER TO REMOVE DIRT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Following directions on cleaning solutions.	Lecture.	Service manual - tapes.	Observation.	Written-oral exam.
Measurements of liquids.	Demonstration.	Ounce, quart, pint and gallon containers.	Observation.	Written-oral exam.
Understanding the flammable properties of solvents.		Cleaning solutions.	Observation.	Written-oral exam.
Selecting the proper types of solutions for cleaning the typewriter.	Lecture.	Fire extinguisher, (CO_2 or purple K) alcohol and matches.		
Cleaning steps: (a) Blowing loose dirt from the typewriter with compressed air. (b) Washing the typewriter with water to remove loose dirt. (c) Placing the typewriter in the cleaning solution. (d) Placing the typewriter in an oven to evaporate all possible moisture (e) Lubricating the typewriter by spraying with a light oil. (f) Wearing protective clothing when working with cleaning agents and solvents. (g) Applying proper ventilating procedures when working with cleaning agents and solvents.	Demonstration.	Service manual. Typewriter. Air compressor. Water hose. Tank with solvent. Oven. Light oil spray cans. Gloves. Goggles. Apron.	Observe the proper steps in cleaning the typewriter and repeat the procedure shown in the demonstration.	Written-oral-visual exam.

TASK NO. 4 ISOLATING THE MECHANICAL DEFECTS TO A PARTICULAR SECTION OF THE TYPEWRITER

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Explaining the basic operation of the typewriter. Explaining the function and movement of each section of the typewriter.	Demonstration with overlays and components. Film.	Overlays - teacher prepared. 1. Carriage mechanism. 2. Rocker trip. 3. Keylever-typebar mechanism. Components: Carriage mechanism. Rocker trip. Keylever-typebar mechanism. Film: "Basic Typing Machine Methods," 20 mins., b & w, Visual Aids Service, Univ. of Illinois, Champaign, Ill.	Operate the typewriter. Explain the function of each section. View film.	Written test. Oral test. Visual test.
Visually inspecting for broken parts, missing screws or other obvious defects.	Demonstrate specific problems and causes. Set up problems for students to observe and interpret.	Typewriters.	Observe demonstration. Trouble shooting for malfunctioning parts.	Observation.
Reading the manufacturer's service reference chart for possible cause of defects.	Explain the organization of an instruction manual and how to use it. Set up defective typewriters.	Typewriters. Manuals corresponding to machines in use.	Determine the defect of his typewriter by referring to service manual.	Written test. Observation.
Eliminating the possible causes of the defect until the particular section is found. Checking clearances between parts with a feelergage.	Set up situation and demonstrate the proper steps to eliminate the causes of trouble.	Typewriter. Service manual. Charts on tools. Tools: Disassembly tools. Feeler gauge.	Create a situation where student determines the cause of trouble set up by partner (students work in pairs).	Observation. Oral examination. Written examination.

TASK NO. 5 ISOLATING THE ELECTRICAL DEFECTS TO A PARTICULAR COMPONENT OF THE TYPEWRITER

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogs, service manuals, schematics and handbooks.	Distribute materials to students and explain the use of these.	Drawings specifications, manufacturer's catalogs, service manuals, schematics and handbooks.	Study these materials in order to recognize the parts of the typewriter and the causes of defects.	Written examination. Oral examination.
Recognizing the various electrical parts of the typewriter.	Demonstration.	Manuals. Typewriter. Overlays - teacher prepared: motor. on-off switch.	Observing demonstration. Reading manual.	Written - oral examination.
Interpreting meter readings to determine the condition of the components. Inspecting the components with a continuity tester VOM meter to eliminate the possible cause of trouble until the defective component is found. Selecting the appropriate electrical meters for the job to be done. Connecting electrical meters in the proper manner. Observing safety precautions when working with live circuits. Determining the correct method of inspecting, checking, and calibrating electrical meters. Recognizing the importance of proper connections of electrical meters. Applying the proper care, maintainence and storage of the electrical meters.	Demonstration.	Text or manuals. Charts - (meter). Good and defective electrical parts. Volt meter. Continuity tester. AMP meter. Test leads.	Observation of demonstration. Test equipment or parts using meters - by method demonstrated by the instructor.	Written - oral-visual examination.

TASK NO. [illegible] ISOLATING THE MECHANICAL DEFECTS TO A PARTICULAR COMPONENT OF THE TYPEWRITER

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting the manufacturer's diagram to follow the movement of parts in the typewriter. Reading the manufacturer's reference charts for possible cause of trouble.	Explain and interpret the manufacturer's diagrams.	Manufacturer's diagrams. Manual. Typewriters.	Visual inspecting of typewriters for obvious mechanical defects. Reading the manufacturer's reference manuals to locate the cause of trouble in individual typewriters.	Observe students. Written examination.
Explaining the basic operation of the typewriter.	Demonstration with overlays and components. Film.	Overlays - teacher prepared 1. Carriage mechanism. 2. Rocker trip. 3. Keylever-typebar mechanism. Components: Carriage mechanism Rocker trip Keylever-typebar mechanism Film: "Basic Typing Machine Method," 20 mins., b & w, Visual Aids Service, Univ. of Illinois, Champaign, Ill.	Observe demonstration. Troubleshooting for malfunctioning part.	Observation.
Explaining the function and movement of each component of the typewriter.	Demonstrate with overlays and actual components.	Overlays - teacher prepared. 1. Carriage. 2. Mainspring. 3. Motion & shift mechanism. 4. Platen. 5. Variable. 6. Ring and cylinder. 7. Line space lever. 8. Margin stops. 9. Rock, pinion, and starwheel. 10. Universal bar. 11. Escapement action. 12. Space bar. Components (same as above).	Observe demonstration. Examine parts individually.	Written - oral examination.
Recognizing the various parts, etc.	Demonstration.	Overlays- teacher prepared. Manual. Typewriter.	Listening and observing demonstration. Listening to tapes and responding on typewriters by: Removing the platen. Removing the feed rolls. Removing the rubber feet. Removing all other rubber or other fabric parts that may be affected by the solvent Removing the carriage assembly. Removing all side and cover plates. Removing all electrical components and connections.	Written - oral - visual examination.

Task No. 6 (continued)

AREA OF NORMAL REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURE
Visually inspecting for broken parts, missing screws, or other obvious defects.	Demonstrate specific problems and causes. Set up problems for students to observe and interpret.	Typewriters.	Observe demonstration troubleshooting for malfunctioning part.	Written - oral - visual examination.

TASK NO. 7 REMOVING THE DEFECTIVE PART(S) OF THE TYPEWRITER

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks.	Explain the use of drawings, specifications, and manufacturer's catalogues.	Drawings, specifications, manufacturer's catalogues, service manuals. Typewriter.	Study the drawings, specification, manufacturer's catalogues, etc.	Written - oral examination.
Interpreting the manufacturer's diagrams to follow the movement of parts in the typewriter.	Explain how to use the manufactuer's diagrams to follow the movements of parts in the typewriter, and/or use prerecorded tapes.	Manufacturer's diagrams. Typewriter. Tapes - teacher prepared.	Observe the manufacturer's diagrams to follow the movement of parts in the typewriter. Listen to tapes.	Written - oral examination.
Recognizing the various parts of the typewriter.	Demonstration.	Overylays - teacher prepared. Manuals. Typewriter.	Create a situation so that the student can have the opportunity to question the operator.	Written - oral - visual examination.
			Create a situation so that the student can have the opportunity to observe the operation of the typewriter.	Written - oral - visual examination.
Selecting the proper type and size of: a. screwdrivers. b. pliers. c. wrenches. d. cutters. e. nutdrivers.	Demonstrate the use, care, methods of application for tools.	Manuals. Typewriter. Screwdrivers. Pliers. Wrenches. Cutters. Nutdrivers.	Create a situation so that the student can operate the typewriter.	Written - oral - visual examination.
			Observe demonstration.	Written - oral - visual examination.
Recognizing the proper methods of holding wrenches.			Refer to service manual to select proper tools to repair typewriter and remove parts.	
Applying the proper methods of holding the work.			Practice using tools.	
Applying methods of holding pliers for pulling, pressing and twisting.				
Recognizing the results of using pliers for removing nuts and bolts.				
Applying the proper procedures for cutting with diagonal cutters.				
Determining the proper methods of stripping wire.				
Recognizing the various types of fastening devices.				
Recognizing the various types, uses, and characteristics of threaded fasteners.				
Recognizing the various types and uses of washers.				
Applying the proper methods of installing threaded fasteners.				
Recognizing the difference between right and left hand threads.				
Applying the proper care, maintenance and storage of tools.				

Task No. 7 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Removing the defective part with the appropriate tools.	Demonstration, and "set up" defective typewriters for students.	Service manual. Tools. Typewriters.	Observe demonstration. Remove defective part with appropriate tools.	Written - oral - visual examination.
Removing the defective parts with special tools indicated by the service manual.	Demonstration.	Service manual. Special tools. Typewriters.	Observe demonstration. Remove defective part with special tools indicated in the service manual.	Written - oral - visual examination.

TASK NO. 8 REPLACING THE DEFECTIVE PART(S) OF THE TYPEWRITER

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks.	Explain the use of drawings, specifications, manufacturer's catalogues.	Drawings, specification, service manuals, manufacturer's catalogues. Typewriter.	Observe demonstration. Listen to tapes and respond on typewriter by: Removing the platen. Removing the feed rolls. Removing the rubber feet. Removing all other rubber or other fabric parts that may be affected by the solvent. Removing the carriage assembly. Removing all side and cover plates. Removing all electrical components and connections.	Written - oral - visual examination
Recognition of various parts of the typewriter.	Demonstration.	Overlays - teacher prepared. Manuals. Typewriter.	Study these materials in order to recognize the parts of the typewriter and the causes of defects.	Written - oral examination.
			Observe demonstration. Read manual.	Written - oral examination.
			Observe demonstration. Test equipment or parts using meters by the method demonstrated by the instructor.	Written - oral - visual examination.
Replacing the defective parts with the appropriate tools.	Demonstration.	Typewriter. Tools. Servicemanuals.	Observe demonstration. Replace the defective part with the appropriate tools.	Written - oral - visual examination.
Replacing the defective parts with special tools.	Demonstration with special tools.	Typewriter. Special tools. Servicemanual.	Observe demonstration. Replace the defective parts with special tools.	Written - oral - visual examination.
Lubricating parts to specification as indicated in service manual.	Demonstration using typewriter to show proper methods of oiling.	Typewriter. Oil can with oil. Rags. Servicemanuals.	Observe demonstration. Lubricate parts to specifications indicated in service manual.	Written - oral - visual examination.

Task No. 8 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the various parts of the typewriter. Selecting the proper type and size of: a. screwdrivers. b. pliers. c. wrenches. d. cutters. e. nutdrivers. Applying the proper care, maintenance and storage of tools. Recognizing the proper methods of holding wrenches. Applying the proper methods of holding the work. Applying methods of holding pliers for pulling, pressing and twisting. Recognizing the results of using pliers for removing nuts and bolts. Applying the proper procedures for cutting with diagonal cutters. Determining the proper methods of stripping wire. Recognizing the various types of fastening devices. Recognizing the various types, uses and characteristics of threaded fasteners. Recognizing the various types and uses of washers. Applying the proper methods of installing threaded fasteners. Recognizing the difference between right and left hand threads.	Show the use, care, methods of application for tools.	Typewriter. Manual. Tools: Screwdriver. Pliers. Wenches. Cttors. Ntdrivers.	Observe the manufacturer's diagrams to follow the movement of parts in the typewriter. Listen to tapes.	Written - oral examination.
Practicing safety precautions noted in the service manual.	Lecture on safety. Demonstrate safe and proper method of manipulating tools and materials.	Typewriter. Sevice manual. Tools.	Take notes on lecture Observe demonstration Read service manual	Written exam Oral exam

TASK NO. 9 REASSEMBLING THE REPAIRED TYPEWRITER

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGESTED INSTRUCTIOIAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks.	Distribute materials to students and explain the use of materials.	Drawings. Specifications Manufacturer's catalogues. Service manuals. Schematics. Hand tools.	Study these materials in order to recognize the parts of the typewriter and the causes of defects.	Written - oral examination.
Recognizing the various parts of the typewriter.	Demonstration.	Overlays - techer prepared. Typewriter. Manuals.	Observe demonstration. Reading manual.	Written - oral examination.
Recognizing the various parts of the typewriter. Selecting the proper type and size of: a. screwdrivers. b. pliers. c. wrenches. d. cutters. e. nutdrivers. Applying the proper care, maintenance and storage of tools. Recognizing the proper methods of holding wrenches. Applying the proper methods of holding the work. Applying methods of holding pliers for pulling,pressing,and twisting. Recognizing the results of using pliers for removing nuts and bolts. Applying the proper procedures for cutting with diagonal cutters. Determining the proper methods of stripping wire. Recognizing the various types of fastening devices. Recognizing the various types, uses, and characteristics of threaded fasteners. Recognizing the various types and uses of washers.	Show the use, care, methods of application for tools.	Typewriter. Manuals. Tools: Screwdriver. Pliers. Wrenches. Cutters. Nutdrivers.	Observe demonstration. Refer to service manual to select proper tools to repair typewriter and remove parts. Practice using tools.	Written - oral -visual examination.

Task No. 9 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reassembling the repaired typewriter with appropriate tools.	Demonstration using tools and typewriter.	Tools. Service manual. Typewriter.	Observe demonstration. Reassemble the repaired typewriter with the appropriate tools.	Written - oral - visual examination
Reassembling the repaired typewriter with special hand tools as indicated by the service manual.	Demonstration using special tools.	Special tools. Typewriter. Service manual.	Observe demonstration. Reassemble the repaired typewriter with special handtools as indicated by the service manual.	Oral - visual examination

TASK NO. 10 TESTING THE OPERATION OF THE REPAIRED TYPEWRITER

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting instructions from service manual for check points on the typewriter.	Explain how to use the service manual to check point typewriter.	Typewriter. Service manual. Tools.	Interpreting instructions from service manual for check points on the typewriter. Operating repaired typewriters.	Written - oral examination.
Explaining the basic operation of the typewriter.	Demonstration.	Overlays-teacher prepared. 1. Carriage mechanism. 2. Rocker trip. 3. Keylever-typebar mechanism.	Operate the typewriter. Explain the function of each section. View film.	Written test. Oral test. Visual test.
Explain the function and movement of each part of the typewriter.	Demonstration.	Overlays - teacher prepared. 1. Carriage. 2. Mainspring. 3. Motion & shift mechanism. 4. Platen. 5. Variable. 6. Ring & cylinder. 7. Line space lever. 8. Margin stops. 9. Rock, pinion, & starwheel. 10. Universal bar. 11. Escapement action. 12. Space bar.	Observe demonstration. Troubleshooting for malfunctioning part.	Oral exam. Visual exam.
Operating the typewriter to determine performance.	Demonstration on operating typewriter to determine performance.	Typewriter. Service manual. Tools.	Operating the typewriter to determine performance.	Oral - visual examination.

OCCUPATIONAL INFORMATION FOR BUSINESS MACHINE SERVICING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
The employment outlook: 1. Local 2. National	Lecture using graphs. Classified ads.	Graphs - teacher-prepared. Bulletins. Department of Labor Bulletin # 1450-13. Local newspapers. Publication: Occupational Outlook Handbook, 1966-67 edition, Washington, D.C.: Government Printing Office.	Listening to lecture. Observing graphs. Reading bulletins and classified ads.	Oral questioning.
The wage scale : 1. Local a. union (1) apprentice (2) journeyman b. non-union (1) entry wage (2) experienced	Lecture using graphs. Local union representative.	Graphs or transparencies. Local Union Headquarters: 1126 16th Street, N.W.,Washington, D.C.	Listening to lecture. Observing graphs.	Oral questioning.
Types of training available: 1. Apprenticeships 2. Technical or trade schools. 3. On-the-job.	Lecture. Bulletins and letters from manufacturers and technical schools. Visiting a repair shop.	Bulletins and letters from manufacturers' and technical schools. Local service shop. Bulletin #1450-13, U.S. Department of Labor.	Listening to lecture. Reading bulletins and letters from manufacturers and technical schools. Field trip to a repair shop.	Oral questioning. Discussion of field trip.
The working conditions experienced in the occupation.	Lecture. Field trip to a repair shop to observe and discuss conditions with the men in shop.	Local repair shop. Bulletin #1450-13, Department of Labor.	Listening to lecture. Field trip to repair shop to observe and discuss working conditions with men in shop.	Oral questioning. Discussion of field trip.
Physical and mental characteristics needed for qualification for employment.	Discussion - teacher directed or by guidance counselor.	Bulletin #1450-13, Department of Labor. Letter from repair shops and technical schools.	Listening to lecture. Read U.S. Department of Labor bulletin #1450-13 and letters from repair shop and technical schools.	Oral questioning.
Geographical location of employment.	Lecture.	Maps and graphs. Letters to national manufacturers.	Listening to lecture. Observing maps and graphs.	Oral questioning.
The opportunities for advancement.	Lecture. Local serviceman.	Bulletin #1450-13, Department of Labor. Letters from repair shops and manufacturers.	Listen to lecture. Read U.S. Department of Labor bulletin #1450-13 and letters from repair shops and manufacturers.	Oral examination.

OCCUPATIONAL INFORMATION UNIT FOR BUSINESS MACHINE SERVICING (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
The advantages and disadvantages of the occupation.	Lecture - and/or field trip.	Bulletin #1450-13, Department of Labor. Field trip to discuss work with men in shop.	Listen to lecture. Read U.S. Department of Labor bulletin #1450-13. Field trip to shop to talk to workmen.	Oral examination and discussion of field trip.
The nature of the work involved in the occupation.	Lecture - and/or field trip.	Bulletin #1450-13, Department of Labor. Letters from manufacturers' and repair shops. Field trip to repair shop.	Listen to lecture. Read U.S. Department of Labor bulletin #1450-13 and letters from manufacturers and repair shops. Field trip to repair shop to observe and discuss nature of work with men in shop.	Oral examination and discussion of field trip.

HOME APPLIANCE SERVICING

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Interpreting the customer's complaint concerning the malfunction of the appliance	Lecture. Participation-student-student interaction.	Customer with appliance: Coffee maker, Room heater, Toaster	Students act out skit with customers in deriving from his complaint the malfunction of the appliance. List possible failure causes.	Check complaint list all possible causes.
Visually inspecting for obvious defects in the cord and plug of the appliance.	Demonstration. Practical work.	Faulty cord and plug. Good cord and plug.	Determine a defect in the cord and plug from observation.	Test student's ability to recognize a defect in cord and plug and to recognize a good one.
Visually inspecting for obvious defects in the appliance.	Demonstration. Practical work.	Appliance with malfunction. Broken linkage, etc.	Examining appliances to determine malfunction.	Ask students to identify faulty area of component.
Isolating the appliance in order to observe the malfunction.	Practical work.	Faulty appliances.	Plug the appliance into a convenience receptical. Note malfunction and compare with customer complaint.	Observe student work.
Locating the malfunctions of the appliance on a service ticket.	Practical work.	Service tickets. Textbook: <u>Electrical Appliance Servicing</u>, William H. Crouse, I.C.S., Scranton, Pa. Serial 5729A, 1965.	Fill out service record ticket.	Check that all entries are correct and all information is given.
Explaining the basic operation of the appliance.	Demonstration. Lecture. Practical work.	An appliance: Toaster, Coffee maker, Room heater	Students lecture to their group, explaining the operation of an appliance.	Listen for misinformation.

TASK NO. 21 DISASSEMBLING SMALL HEATING ELEMENT APPLIANCES FOR TESTING AND REPAIRING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks. To determine: (a) Installation procedures and techniques. (b) Service procedures. (c) Type, function and rating of defective part. (d) Electrical supplies. (e) Special service tools. (f) Electrical code.	Demonstration. Lecture. Practical work.	Manufacturer's service manual. Parts List Textbooks: Electrical Appliance Servicing, William H. Crouse, T.C.S., Scranton, Pa., Serial 6729A (1965), p. 1-32. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc., (1965), p. 115. Major Appliance Servicing, Percy T. Brockwell, Jr. McGraw-Hill Book Co., (1958), p. 211.	Reading drawings, schematics, specifications, and catalogues. Identifying components from drawings. Identifying special tools. Writing the specifications for defective parts.	Written quiz on reference material. Write an order for a replacement part. Observe the proper use of special tools.
Selecting the proper type, size and tip of screwdriver for the job to be done: (a) Regular (b) Ratchet (c) Offset (d) Spiral (e) Insulated (f) Wedge, clip (screw holding) (g) Standard slot (h) Phillips (i) Square socket	Demonstration. Lecture.	Assortment of screws (head type). Screwdrivers.	Pick out the screwdriver that fits the job you are doing.	Observe the correct usage of screwdrivers.
Selecting the proper wrenches for the job to be done: (a) Open end (b) Box end (c) Socket with ratchet & extensions (d) Adjustable (e) Spanner (hook, face, special)	Demonstration. Lecture.	Assortment of wrenches. A job situation (appliance). "ABC's of Hand Tools, free publication by General Motors, Detroit, Mich.	Select the wrench that fits the job without damage.	Observe the use of wrenches by students.
Recognizing the proper method of holding wrenches.	Demonstration. Practical work.	Assorted hand wrenches.	Holding, handling, and using tools correctly.	Observe students at work.
Selecting the proper type, size and characteristics of pliers for the work to be done: (a) Slip joint (b) Combination (c) Long, round, & needle nose (d) Crimping (e) Vice grip	Demonstration. Practical work.	Assortment of pliers: Slip joint Combination Needle nose Vice grip, etc.	Working with pliers in the manner recommended in "ABC's" of Handtools."	Observe students at work.

Task No. 2 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the results of using pliers for removing nuts and bolts.	Demonstration.	Pliers. Nuts and bolts.	Remove nut from bolt with pliers and observe damage.	Observe the correct usage of pliers.
Applying methods of holding pliers for pulling, pressing, and twisting.	Demonstration.	Pliers.	Twisting, pulling, and pressing with pliers.	Observe students.
Applying the proper methods of holding work.	Demonstration. Practical work.	Holding devices: Clamps Vises	Securing work for safe operation.	Student demonstrates his ability to secure work to prevent accidents and facilitate repairs.
Selecting the proper types and sizes of cutters for the job to be done: (a) Side, end and diagonal (b) Wire stripper (c) Knives	Demonstration. Practical work.	Cutters. Knives. Wire strippers. Assortment of wire sizes.	Selecting the proper cutter for the job to be done.	Observe students at work.
Applying the proper procedures for cutting with diagonal cutters.	Demonstration. Practical work.	Cutters. Wire.	Cutting wire with diagonal cutters.	Observe students cutting correctly.
Determining the proper method of stripping wire.	Demonstration. Practical work.	Wire strippers. Wire. Textbook: Reliable Electrical Connections, Technology Handbook, 3rd edition, NASA Sp-5002, George C. Marshall, Space Flight Center, Huntsville, Alabama, Dec. 1963, James A. Gay, Jr.	Removing the insulation from wires with pliers.	Observe students correctly strip wire.
Selecting the proper size and type of nutdriver for the job to be done.	Demonstration. Practical work.	Nutdrivers. Bolts. Textbook: ABC's of Hand Tools, free publication by General Motors, Inc., Detroit, Mich., p. 211.	Removing and installing bolts and nuts with nutdrivers.	Observing students working with tools.
Applying the proper care, maintenance and storage of tools.	Demonstration. Practical work.	ABC's of Hand Tools, free publication by General Motors, Inc., Detroit, Mich.	Maintaining tools in a working condition.	Inspection of care, maintenance, and storage of tools.

Task No. 2 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the various types of fastening devices: (a) Threaded fasteners Bolt and nut Cap screw Machine screw Set screw Sheet metal & self-tapping screw Stud bolt (b) Keys, rivets & springs (c) Cotterpins & shear pins (d) Retaining rings.	Demonstration. Practical work.	Various fastening devices.	Working with various fastening devices to determine the characteristics of each.	Observe the use of fastening devices. Quiz on the uses of different fastening devices.
Recognizing the various types & uses of washers.	Demonstration. Display.	Assortment of various washers.	Student determines the correct usage of washers.	Observe the proper application of washers.
Applying the proper methods of installing threaded fasteners.	Demonstration. Practical work.	Handtools: Wrenches Nutdrivers Screwdrivers Threaded fasteners	Installing threaded fasteners in the appliance.	Observe the correct usage of tools as to not damage threaded fasteners.
Recognizing the difference between right and left hand threads.	Demonstration. Practical work.	Parts manual. Service manuals. Left hand threads. Right hand threads.	Student will identify left and right hand threads. Read service manual and parts manual for application of left hand threads.	Test students ability to read service manual to determine location of left hand threads.
Applying the proper safety precautions: (a) Wearing safety shoes with non-conducting soles. (b) Removing jewelry & items of clothing with metal fasteners. (c) Providing work situations where moisture is present. (d) Disconnecting the appliance before attempting servicing. (e) Properly grounding appliance.	Demonstration. Lecture. Film.	Defective appliance. V.O.M. Film: "The Factory: How a Product is Made," borrow from Encyclopedia Britania. Textbooks: How to Repair Electrical Appliances, Book 2, H. P. Manly, Frederick J. Drake & Co, Publishers (1964), p. 265. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 95.	Students will observe safety rules and regulations. Listen to film on safety. Watch demonstration of effects of shorted, ungrounded appliance.	Quiz on film. Quiz on safety rules and regulations.
Removing the fasteners and the cover plate of the appliance with the appropriate tools.	Demonstration. Practical work.	Service manuals. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sons and Co., Inc. (1965), Chapter 1.	Students will correctly, according to the reference, remove the cover plates from the appliance.	Observe students using the service manual.

TASK NO. 5: ISOLATING THE DEFECT TO A PARTICULAR SECTION OF THE HEATING ELEMENT APPLIANCE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks to determine: (a) Installation procedures & techniques. (b) Service procedures. (c) Type, function & rating of defective part. (d) Electrical supplies. (f) Special service tools. (g) Electrical code.	Demonstration. Lecturer. Practical work.	Manufacturer's service manual. Parts Lists. Textbooks: Electrical Appliance Servicing, William H. Crouse, T.C.S. Scranton, Pa., Serial 6729A (1965), p. 1-32. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc., (1965), p. 113. Major Appliance Servicing, Percy T. Brockwell, Jr. McGraw-Hill Book Co., (1958), p. 211.	Reading drawings, schematics, specifications, and catalogues. Identifying components from drawings. Identifying special tools. Writing the specifications for defective parts.	Written quiz on reference material. Write an order for a replacement part. Observe the proper use of special tools.
Reading the manufacturer's service reference chart for possible causes of the trouble.	Independent reading.	Service reference. Charts for various appliances.	Reading troubleshooting chart to determine cause of failure of the appliance.	Quiz on service reference charts to check reading comprehension of students.
Interpreting meter readings to determine the condition of components.	Demonstration. Practical work.	Continuity tester. V.O.M. Heating element appliances. Textbook: How to Repair Electrical Appliances, Book 2, H. P. Manly, Frederick J. Drake & Co.Publishers, Chapter 10.	Reading meters connected to components to determine their condition. Hooking up the V.O.M. to components.	Quiz on identification of faulty components as detected with instruments.
Computing Ohm's Law to determine amperage, voltage and resistance.	Practical work.	Quiz on Ohm's Law.	Computing Ohm's Law problems.	Quiz on Ohm's Law.
Explaining the electron theory of current flow in the appliance.	Films.	Films: "Introduction to Electricity," Cornet Films, Wilmette, Ill., borrow from Encyclopedia Britannica. "Basic Electricity - The Electron Theory," 5 min., Cornet Films, Wilmette, Ill., borrow from Encyclopedia Britannica.	Listening to film.	Quiz on film.
Explaining the basic operation of the appliance.	Demonstration. Lecture. Practical work.	An appliance: Toaster Coffee maker Room heater	Students lecture to their group, explaining the operation of an appliance.	Listen for misinformation.

Task No. 3 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the importance of proper connection of appropriate electrical meters.	Demonstration. Practical work.	Continuity tester. V.O.M. Textbooks: How to Repair Electrical Appliances, Book 2, H. P. Manly, Frederick J. Drake & Co., Publishers, p. 273. Simplified Electrical Appliance Servicing, Arthur Stephens, Simpson Electric Company (1966), Chicago, Ill.	Connecting meters in a circuit correctly.	Observe the connection of meters in a circuit by students.
Selecting the appropriate electrical meters for the job to be done: (a) Voltmeters (b) Amp meter or Amp probe (c) Continuity tester (d) Volt-Ohm meter (V.O.M.)	Demonstration.	Voltmeters Ammeter Continuity V.O.M. Textbooks: How to Repair Electrical Appliances, Book 2, H. P. Manly, Frederick J. Drake & Co., Publishers, p. 264. Simplified Electrical Appliance Servicing, Arthur Stephens, Simpson Electric Company (1966), Chicago, Ill.	Students will determine test to be made and select a meter accordingly.	Quiz on identification of meters and their function.
Applying the proper care, maintenance, and storage of electrical meters.	Demonstration. Practical work.	Textbooks: How to Repair Major Appliances, Ernest Tricomi, Howard W. Sams & Co., Inc., (1966), Chapter 1. Simplified Electrical Appliance Servicing, Arthur Stephens, Simpson Electric Company (1966), Chicago, Ill., p. 2-3.	Maintaining meters in proper working condition.	Observe the storage and maintenance of electrical meters.
Determining the correct method of inspecting, checking, calibrating electrical meters to known standards.	Demonstration. Practical work.	Meters. Manuals. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephens, Simpson Electric Company (1966), Chicago, Ill.	Calibrating meters according to the manual peculiar to the meter.	Check meters for correct calibration.
Visually inspecting for obvious electrical defects in the appliance.	Practical work.	Defective appliances. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc., (1965), Chapter 2.	Inspecting appliances for obvious defects such as broken line, plug and socket, etc.	Check to see that students are recognizing obvious defects.

Task No. 3 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Connecting electrical meters in the proper manner.	Demonstration. Practical work.	Appliances. Electrical meters: V.O.M. Amp-meter probe Continuity tester. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephens, Simpson Electric Company (1966), Chicago, Ill.	Students will connect meters in a circuit according to manual.	Test on student performance in connecting electrical meters.
Inspecting the electrical components with the appropriate electrical meters to locate the defective section.	Practical work.	Switches, controls, heating elements. Electrical meters: V.O.M. Amp-meter Continuity tester. Textbooks: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), Chapter 2. Simplified Electrical Appliance Servicing, Arthur Stephens, Simpson Electric Company (1966), Chicago, Ill.	Testing components to localize the malfunction in the appliance.	Check students ability to locate defective components with electrical meters.
Determining voltage and resistance in the appliance with a volt-Ohm meter.	Demonstration. Practical work.	Appliances (small). V.O.M.'s. Textbooks: How to Repair Electrical Appliances, Book 2, H. P. Manly (1964), Frederick J. Drake & Co., Publishers, p. 270-271. Simplified Electrical Appliance Servicing, Arthur Stephens, Simpson Electric Company (1966), Chicago, Ill.	Measuring the voltage and resistance in the appliances with volt-Ohm meter. Recording meter readings on job sheet.	Check resistance and voltage measurements against known values.

TASK NO 4: ISOLATING THE DEFECT TO A PARTICULAR COMPONENT OF THE HEATING ELEMENT APPLIANCE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks to determine: (a) Installation procedures & techniques. (b) Service procedures. (c) Type, function & rating of defective part. (d) Electrical supplies. (e) Special service tools. (f) Electrical code.	Demonstration. Lecture. Practical work.	Manufacturer's service manual. Parts Lists. Textbooks: Electrical Appliance Servicing, William H. Crouse, T.C.S. Scranton, Pa., Serial 6729A (1965), p. 1-32. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc., (1965), p. 113. Major Appliance Servicing, Percy T. Brockwell, Jr. McGraw-Hill Book Co., (1958), p. 211.	Reading drawings, schematics, specifications, and catalogues. Identifying components from drawings. Identifying special tools. Writing the specifications for defective parts.	Written quiz on reference material. Write an order for a replacement part. Observe the proper use of special tools.
Interpreting meter readings to determine condition of components.	Demonstration. Practical work.	Heating element appliance. V.O.M. Continuity tester. Textbook: How to Repair Electrical Appliances, Book 2, H. P. Manly (1964), Frederick J. Drake & Co., Publishers	Reading meters connected to components to determine their condition. Hooking up the V.O.M. to components.	Quiz on identification of faulty components as detected with instruments.
Interpreting instructions and information located on the data plate of the unit.	Demonstration. Lecture.	Unit data plates. Service manuals.	Reading data plates and following instructions.	Checksheet as to accuracy of interpretation.
Computing Ohm's Law to determine amperage, voltage and resistance	Practical work.	Quiz on Ohm's Law.	Computing Ohm's Law problems.	Quiz on Ohm's Law.
Explaining the electron theory of current flow in the appliance.	Film.	Film: "Electrons," 10 min., rent from Encyclopedia Britannica.	Listening to film.	Quiz on film.
Applying the proper methods of checking for electrical grounds.	Demonstration. Practical work.	Small appliances. V.O.M.	Inspecting the appliance with electrical meters to determine grounds.	Observe the correct application of electrical meters.
Inspecting the appliance for defective accessories: (a) Blanket & pad material (b) Plastic foot & handles (c) Insulation (d) Pilot lights (e) Grill plates.	Demonstration. Practical work.	Defective appliance accessories. V.O.M.	Examine each accessory visually and with a V.O.M. as required to determine defective parts or components.	Observe the use of meters. Check students ability to recognize defective components.

Task No. 4 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the importance of proper connections when using the appropriate electrical meters.	Demonstration. Practical work.	Appliances. V.O.M. Continuity tester. Textbooks: How to Repair Electrical Appliances, Book 2, H. P. Manly(1964), Frederick J. Drake & Co., Publishers. Simplified Electrical Appliance Servicing, William H. Crouse, T.C.S., Scranton, Pa., Serial 0729A (1965).	Connecting meters in a circuit correctly.	Observe the connection of meters in a circuit by students.
Selecting the appropriate electrical meters for the job to be done: (a) Voltmeter (b) Amp-meter or Amp-probe (c) Continuity tester (d) Volt - Ohm meter (V.O.M.)	Demonstration.	Voltmeter. Amp-meter. Continuity tester. V.O.M. Textbooks: How to Repair Electrical Appliances, Book 2, H. P. Manly (1964), Frederick J. Drake & Co., Publishers, p. 264. Simplified Electrical Appliance Servicing, Arthur Stephens, Stephen Electric Company (1966), Chicago, Ill., p. 2-3.	Determine the test to be made and select a meter accordingly.	Quiz - identification of meters and their function.
Applying the proper care, storage and maintenance of electrical meters.	Demonstration. Practical work.	Textbooks: How to Repair Major Appliances, Ernest Tricomi, Howard W. Sams & Co., Inc., (1966), Chapter 1. Simplified Electrical Appliance Servicing, Arthur Stephens, Stephen Electric Company (1966), Chicago, Ill., p. 2-3.	Maintain meters in proper working condition.	Observe the storage and maintenance of electrical meters.
Determining the correct method of inspecting, checking, calibrating, electrical meters to known standards.	Demonstration. Practical work.	Meters. Manuals. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephens, Stephen Electric Company (1966), Chicago, Ill.	Calibrating meters according to the manual peculiar to the meter.	Check meters for correct calibration.
Applying the proper safety precautions: (a) Wearing safety shoes with non-conducting soles. (b) Removing jewelry & items of clothing with metal fasteners. (c) Avoiding work situations where moisture is present. (d) Disconnecting the appliance before attempting servicing. (e) Properly grounding appliance.	Demonstration. Lecture. Film.	Defective appliance. V.O.M. Textbook: How to Repair Electrical Appliances, Book 2, H. P. Manly (1964), Frederick J. Drake & Co., Publishers, p. 265. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 97.	Observe safety rules and regulations. Listen to film on safety. Watch demonstration of effects of shorted, ungrounded appliance.	Quiz on film. Quiz on safety rules and regulations.

Task No. 4 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Connecting the electrical meters in the proper manner.	Demonstration. Practical work.	Appliances. Electrical meters: V.O.M. Amp-meter probe Continuity tester Textbook: Simplified Electrical Appliance Servicing, Arthur Stephens, Simpson Electric Company (1966), Chicago, Ill.	Connect meters in a circuit according to manual.	Performance test on connecting electrical meters.
Inpsecting the switch in the heating element appliance for defects with a continuity tester or the appropriate electrical meter.	Demonstration. Practical work.	Continuity tester. V.O.M. Small heating element appliance. Good and defective switch.	Testing switches with meters and testers to determine the condition of components.	Determine students ability to recognize a defective switch after testing.
Inspecting the heating element assembly for defects with a continuity tester or the appropriate electrical meters.	Demonstration. Practical work.	V.O.M. Continuity testers. Heating elements (assorted). Textbooks: Simplified Electrical Appliance Servicing, Arthur Stephens, Simpson Electric Company (1966), Chicago, Ill., p. 12-13.	Testing the heating element assembly with meters.	Determine students ability to recognize a defective heating element assembly.
Inspecting the internal wiring connections for defects with a continuity testers or the appropriate electrical meter.	Practical work.	Continuity testers. V.O.M. Small appliances. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephens, Simpson Electric Company (1966), Chicago, Ill.	Testing connections for defects with meters.	Determine students ability to locate defective electrical connections with meters.
Determining voltage and resistance in the appliance with a volt-Ohm meter.	Demonstration. Practical work.	Appliances (small). V.O.M.'s. Textbooks: How to Repair Electrical Appliances, Book 2, H. P. Manly (1964), Frederick J. Drake & Co., Publishers. Simplified Electrical Appliance Servicing, Arthur Stephens, Simpson Electric Company (1966), Chicago, Ill.	Measuring the voltage and resistance in the appliance with a V.O.M.. Reading meter readings on job sheet.	Check resistance and voltage measurements against known values.
Visually inspecting for obvious defects in the cord and plug of the appliance.	Demonstration. Practical work.	Faulty cord and plug. Good cord and plug.	Determine a defect in the cord and plug from observation.	Test students ability to recognize a defect in cord and plug and to recognize a good one.

TASK NO. 5: REPLACING THE DEFECTIVE PART(S) OF SMALL HEATING ELEMENT APPLIANCE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks to determine: (a) Installation procedures & techniques. (b) Service procedures. (c) Type, function & rating of defective part. (d) Electrical supplies. (e) Special service tools. (f) Electrical code.	Demonstration. Practical work. Lecture.	Manufacturer's service manual. Parts Lists. Textbooks: Major Appliance Servicing, Percy T. Brockwell, Jr., McGraw-Hill Book Co., 1958, N.Y. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc., (1965). Electrical Appliance Servicing. William H. Crouse, T.C.S., Scranton, Pa., Serial 6729A (1965).	Reading drawings, schematics, specifications, and catalogues. Identifying components from drawings. Identifying special tools. Writing the specifications for defective parts.	Written quiz on reference material. Write an order for a replacement part. Observe the proper use of special tools.
Computing Ohm's Law to determine amperage, voltage, and resistance.	Practical work.	Quiz on Ohm's Law.	Computing Ohm's Law problems.	Quiz on Ohm's Law.
Explaining the characteristics of series of parallel circuits used in the appliance.	Demonstration. Film.	Circuit board. Schematics. Film: "Elements of Electric Circuits," rent from Encyclopedia Britannica.	Listening to film. Making a schematic to show a series circuit, parallel circuit.	Quiz on film. Check schematics.
Selecting the proper types of heating elements for a particular appliance: (a) Particular appliance (b) Open (c) Sealed (d) Glass panel (e) Infra red (f) Thermo-electric	Demonstration. Practical work.	Assortment of heating elements. Textbooks: How to Repair Major Appliances, Ernest Tricomi, Howard W. Sams & Co., Inc. (1966), p. 85.	Examining heating elements. Determining correct element from specifications.	Observation of students in selecting correct heating element for a particular appliance.
Identifying different types, purposes, and uses of terminal blocks.	Individual work.	Terminal blocks. Textbooks: How to Repair Electrical Appliances, Book 2, H. P. Manly (1964) Frederick J. Drake & Co., Publishers, pp. 156-58. How to Repair Major Appliances, Ernest Tricomi, Howard W. Sams & Co., 1958, N.Y., p. 51.	Study references and determine the different types of terminal blocks.	Quiz on identification of terminal block.
Recognizing the proper methods of mounting and wiring heating elements.	Practical work.	Examples of various types of elements. Appliances. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1966)., Chapters 2 and 3.	Study references and making connections to mount a heating element in an appliance.	Check wire connections and mounting procedures.

Task No. 5 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the importance of even stretching when installing open type heating elements.	Practical work.	Open type heating elements. Textbook: How to Repair Small Appliances, Ernest Tricomi, Howard W. Sams & Co., Inc. (1965), pp. 61, 85-86.	Stretching open type heating elements before installing in the appliance.	Inspect the correct spacing in the heating coil.
Selecting the proper type and size of: (a) Screwdrivers (b) Pliers (c) Wrenches (d) Cutters (e) Nutdrivers	Demonstration. Practical work.	Screwdrivers. Pliers. Wrenches. Nutdrivers. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 113.	Examining different types of: Screwdrivers. Pliers. Wrenches. Nutdrivers. Using the tools for the purpose for which they were intended.	Observe the correct usage of tools.
Recognizing the proper methods of holding wrenches.	Demonstration. Practical work.	Assorted hand wrenches.	Holding, handling and using tools correctly.	Observe students at work.
Applying the proper methods of holding the work.	Demonstration. Practical work.	Holding devices: clamps vices	Securing work for safe operation.	Student demonstrate his ability to secure work to prevent accidents.
Applying methods of holding pliers for pulling, pressing and twisting.	Demonstration.	Pliers.	Twisting, pulling, and pressing with pliers.	Observe students.
Recognizing the results of using pliers for removing nuts and bolts.	Demonstration.	Pliers. Nuts and bolts.	Remove nut from bolt with pliers and observe damage.	Observe the correct usage of pliers.
Applying the proper procedures for cutting with diagonal cutters.	Demonstration. Practical work.	Cutters. Wire.	Cutting wire with diagonal cutters.	Observe students cutting correctly.
Determining the proper methods of stripping wire.	Demonstration. Practical work.	Wire strippers. Wire. Textbook: Reliable Electrical Connections, Technology Handbook, 3rd edition. NASA SP-5002, George C. Marshall Space Flight Center, Huntsville, Alabama (Dec. 1963), James A. Gay, Jr.	Removing the insulation from wires with strippers.	Observe students stripping wire.

Task No. 5 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the various types of fastening devices: (a) Threaded fasteners: bolt & nut cap & screw machine screw set screw sheet metal & self-tapping screw stud bolt (b) Keys, rivets & springs (c) Cotter pins & shear pins (d) Retaining rings	Demonstration. Practical work.	Various fastening devices.	Working with various fastening devices to determine the characteristics of each.	Observe the use of fastening devices. Quiz on the use of various fastening devices.
Recognizing the various types and uses of washers.	Demonstration. Display.	Assortment of various washers.	Determine the correct usage of washers.	Observe the proper application of washers.
Applying the proper method of installing threaded fasteners.	Demonstration. Practical work.	Handtools: wrenches nutdrivers screwdrivers threaded fasteners	Installing threaded fasteners in the appliance.	Observe the correct usage of tools as to not damage threaded fasteners.
Recognizing the difference between right and left hand threads.	Demonstration. Practical work.	Parts manuals. Service manuals. Left hand threads. Right hand threads.	Identify left and right hand threads. Read service manual and parts manual for application of left hand threads.	Test students ability to read service manual to determine location of left hand threads.
Applying the proper safety precautions: (a) Wearing safety shoes with non-conducting soles. (b) Removing jewelry & items of clothing with metal fasteners. (c) Disconnecting the appliance before attempting servicing. (d) Properly grounding appliance.	Demonstration. Lecture. Film.	Defective appliance. V.O.M. Textbooks: How to Repair Electrical Appliances, Book (1964), H. P. Manly, Frederick J. Drake & Co. Publishers, p. 265. How to Repair Major Appliances, Jack Darr, Howard W. Sams & Co., Inc., (1965), p. 95. Film: "The Factory: How a Product is Made," borrow from Encyclopedia Britannica.	Observe safety rules and regulations. Listen to film. Watch demonstration of effects of shorted, ungrounded appliance.	Quiz on film. Quiz on safety rules and regulations.
Explaining the importance of observing recommended procedures when tightening down plates, covers, and flanges.	Demonstration. Practical work.	Handtools. Small heating element appliances. Service manuals.	Installing cover plates on small appliance according to service manual procedures.	Observe the installation procedures.

Task No. 5 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Replacing heating elements and insulators with the appropriate tools.	Practical work.	Heating elements. Handtools. Insulators. Small appliances. Textbooks: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 85. Electrical Appliance Servicing, William H. Crouse, I.C.S., Scranton, Pa., Serial 6729A (1965), p. 18.	Installing heating elements in the small appliance with the appropriate tools.	Operational check after work is completed.
Replacing broken or damaged wires with the appropriate tools.	Practical work.	Handtools. Service and appliance cord. Appliances. Textbook: Electrical Appliance Servicing, William H. Crouse, I.C.S., Scranton, Pa. Serial 6729A (1965), pp. 8, 18.	Inspecting the appliance to determine broken or damaged wiring. Replacing wiring according to specifications.	Inspect the properly wired appliance.
Tying underwriters knot when replacing a plug.	Practical work.	Wire. Plug. Textbook: Electrical Appliance Servicing, William H. Crouse, I.C.S., Scranton, Pa. Serial 6729A (1965), p. 15.	Students will tie an underwriters knot when needed in the replacement of a plug or wire on the appliance.	Observe the typing of the underwriters knot.
Repairing breaks in open-type coils with solderless connections using crimping pliers.	Practical work.	Open-type coil. Solderless connections. Crimping tools. Textbook: Electrical Appliance Servicing, William H. Crouse, I.C.S., Scranton, Pa., Serial 6729A (1965), p. 18.	Students will repair open-type coil with solderless connections as outlined in the reference manual.	Inspect the repaired coil.
Replacing the defective cord and/or plug.	Practical work.	Appliances. Cord and plug. Handtools. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc., (1965), p. 65.	Installing new cord and plug on an appliance.	Make operational check of the appliance.

TASK NO. 6: TESTING THE OPERATIONS OF THE REPAIRED SMALL HEATING ELEMENT APPLIANCES

AREA OF HUMAN REQUIPEMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATEPIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting meter readings to determine the condition of the components.	Demonstration. Practical work.	Heating element appliances. V.O.M. Continuity tester. Textbook: How to Repair Electrical Appliances, Book 2 (1964), H.P. Manly, Frederick J. Drake & Co, Publishers, Chapter 16.	Reading meters connected to components to determine their condition. Hooking up the V.O.M. to components.	Quiz on identification of faulty components as detected with instruments.
Computing Ohm's Law to determine amperage, voltage and resistance.	Practical work.	Quiz on Ohm's Law.	Computing Ohm's Law problems.	Quiz on Ohm's Law.
Explaining the function of conductors and insulators.	Demonstration. Practical work.	Assorted insulators and types of wire. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc., (1965), p. 65.	Students will be able to determine conductors: Type. Size. Insulation. Students will recognize insulators of different types.	Quiz on conductors and insulators.
Explaining the various methods of heat transfer: (a) Conduction (b) Connection (c) Radiation	Film.	Film: "Nature of Heat," rent from Correct Films, Wilmette, Ill.	Listen to film.	Quiz on film.
Selecting the appropriate electrical meters for the job to be done: (a) Voltmeters (b) Ampmeter or amp-probe (c) Continuity tester (d) Volt-Ohm meter (V.O.M.	Demonstration.	Voltmeter. Ampmeter. Continuity tester. V.O.M. Textbooks: How to Repair Electrical Appliances, Book 2 (1964), H.P. Manly, Frederick J. Drake & Co., Publishers, p. 264. Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill. pp. 2-3.	Determine test to be made and select a meter accordingly.	Quiz on identification of meters and their function.
Determining the correct method of inspecting, checking, calibrating electrical meters to known standards.	Demonstration. Practical work.	Meters. Manuals. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Calibrate meters according to the manual peculiar to the meter.	Check meters for correct calibration.

Task No. 6 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the importance of proper connections when using appropriate electrical meters.	Demonstration. Practical work.	Appliances. V.O.M. Continuity tester. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill., p. 273.	Connect meters in a circuit correctly.	Observe the connection of meters in a circuit by students.
Inspecting the electrical components with the appropriate electrical meters to locate the defective section.	Practical work.	Electrical meters. V.O.M. Ammeters. Continuity tester. Switches, controls, heating elements. Textbooks: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), Chapter 2. Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Test components to localize the malfunction in the appliance.	Check students ability to localize defective components with electrical meters.
Connecting the electrical meters in the proper manner.	Demonstration. Practical work.	Appliances. Electrical meters. V.O.M. Ammeter probe. Continuity tester. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Connect meters in a circuit according to manual.	Test student performance in connecting electrical meters.
Determining voltage and resistance in the appliance with a volt-Ohm meter.	Demonstration. Practical work.	Appliances (small). V.O.M.'s. Textbooks: How to Repair Electrical Appliances, Book 2 (1964) H. P. Manly, Frederick J. Drake & Co., Publishers, p. 270-271. Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Measuring the voltage and resistance in the appliance with a V.O.M. Reading meter readings on job sheet.	Check resistance and voltage measurements against known values.
Applying the proper care, maintenance and storage of electrical meters.	Demonstration. Practical work.	Textbooks: How to Repair Major Appliances, Ernest Tricomi, Howard W. Sams & Co, Inc. (1966), Chapter 1. Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill., p. 2-3.	Maintaining meters in proper working condition.	Observe the storage and maintenance of electrical meters.

TASK NO. 7: REASSEMBLING THE REPAIRED SMALL HEATING ELEMENT APPLIANCE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks to determine: (a) Installation procedures & techniques. (b) Service procedures. (c) Type, function & rating of defective part. (d) Electrical supplies. (e) Special service tools. (f) Electrical code.	Demonstration. Lecture. Practical work.	Manufacturer's service manual. Parts Lists. Textbooks: Major Applicence Servicing, Percy T. Brockwell, Jr. McGraw-Hill Book Co., 1958, New York, N.Y., p. 211. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. p. 113. Electrical Appliance Servicing, William H. Crouse, I.C.S., Scranton, Pa., Serial 6729A (1965), pp. 1-32.	Reading drawings, schematics, specifications. Identifying components from drawings. Identifying special tools. Writing the specifications for defective parts.	Written quiz on reference material. Write an order for a replacement part. Observe the proper use of special tools.
Applying the proper methods of checking for electrical grounds.	Demonstration. Practical work.	Appliance, small. V.O.M.	Inspecting the appliance with electrical meters to determine grounds.	Observe the correct application of electrical meters.
Recognizing the various parts of the appliance.	Demonstration. Practical work.	Service manuals. Appliances.	Locating components of the appliance from the service manual. Identifying parts by name with aid of service manual.	Quiz on "name that part."
Selecting the proper type and size of: (a) Screwdrivers (b) Pliers (c) Wrenches (d) Cutters (e) Nutdrivers	Demonstration. Practical work.	Screwdrivers. Pliers. Wrenches. Nutdrivers. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 113.	Examining different types of: Screwdrivers. Pliers. Wrenches. Nutdrivers. Using the tools for the purpose for which they were intended.	Observe the correct usage of tools.
Applying the proper care, maintenance and storage of tools	Demonstration. Practical work.	"ABC's of Handtools," published by General Motors.	Maintaining tools in a working condition.	Inspection of care, maintenance, and storage of tools.
Recognizing the proper methods of holding wrenches.	Demonstration. Practical work.	Assorted hand wrenches.	Holding, handling, and using tools correctly.	Observe students at work.
Applying methods of holding pliers for pulling, pressing and twisting.	Demonstration.	Pliers.	Twisting, pulling, and pressing with pliers.	Observe students.
Recognizing the results of using pliers for removing nuts and bolts.	Demonstration.	Pliers. Nuts and bolts.	Remove nut from bolt with pliers and observe damage.	Observe the correct usage of pliers.

Task No. 7 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Applying the proper procedures for cutting with diagonal cutters.	Demonstration. Practical work.	Cutters. Wire.	Cut wire with diagonal cutters.	Observe students cutting correctly.
Determining the proper method os stripping wire.	Demonstration. Practical work.	Wire strippers. Wire. Textbook: Reliable Electrical Connections, Technology Handbook, 3rd edition. NASA SP-5002, George C. Marshall Space Flight Center, Huntsville, Alabama, Dec. 1963, James A. Gay, Jr.	Removing the insulation from wires with strippers.	Observe students stripping wire.
Recognizing the various types of fastening devices: (a) Threade fasteners bolt and nut cap screw machine screw set screw sheet metal & self-tapping screw stud bolt (b) Keys, rivets & springs (c) Cotter pins & shear pins (d) Retaining rings.	Demonstration. Practical work.	Various fastening devices.	Working with various fastening devices to determine the characteristics of each.	Observe the use of fastening devices. Quiz on the uses of different fastening devices.
Recognizing the various types and uses of washers.	Demonstration. Display.	Assortment of various washers.	Determining the correct usage of washers.	Observe the proper application of washers.
Applying the proper methods of installing threaded fasteners.	Demonstration. Practical work.	Handtools: Wrenches Nutdrivers Screwdrivers Threaded fasteners	Installing threaded fasteners in the appliance.	Observe the correct usage of tools as to not damage threaded fasteners.
Recognizing the difference between right and left hand threads.	Demonstration. Practical work.	Parts manuals. Service manuals. Left hand threads. Right hand threads.	Identify right and left hand threads. Read service manual and parts manual for application of left hand threads.	Test students ability to read service manual to determine location of left hand threads.

Task No. 7 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Applying the proper safety precautions: (a) Wearing safety shoes with non-conducting soles. (b) Removing jewlery & items of clothing with metal fasteners. (c) Providing work situations where moisture is present. (d) Disconnecting the appliance before attempting servicing. (e) Properly grounding appliance.	Demonstration. Lecture. Film.	Defective appliance. V.O.M. Textbooks: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, p. 265. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1966), p. 95. Film: "The Factory: How a Product is Made," borrow from Encyclopedia Britannica.	Observe safety rules and regulations. Listen to film. Watch demonstration of effects of shorted, ungrounded appliance.	Quiz on film. Quiz on safety rules and regulations.
Explaining the importance of observing recommended procedures when tightening down plates, covers, and flanges.	Demonstration. Practical work.	Handtools. Small heating element appliance. Service manuals.	Installing cover plates on small appliances according to service manual procedures.	Observe the installation procedures.
Applying lubricant on linkage and levers of the appliance.	Practical work.	Service manuals. Lubricants - high temperature. Appliances.	Students apply the specified lubricants to appliance linkage according to specifications.	Check of appliance for correct lubrication.
Dressing contacts on plug-in type elements with abrasive cloth.	Demonstration. Practical work.	Heating elements. Abrasive cloth. Service manual. V.O.M.	Cleaning contacts to insure proper contact.	Examine cleaned parts. Test with V.O.M. (resistance).
Cleaning all dirty components with a small brush.	Practical work.	Small brushs. Components and controls. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 95.	Cleaning components to insure proper functioning in the appliance.	Check to see that all components are properly cleaned.
Replacing the fasteners and cover plates with the appropriate tools.	Demonstration. Practical work.	Handtools. Cover plates. Service manuals.	Installing cover plates on the appliance to resotre original condition.	Inspect the appliance to observe the correct usage of tools, correct assembly and functioning item.

TASK NO. 8: RETESTING THE ASSEMBLED SMALL HEATING ELEMENT APPLIANCE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting instructions from the service manual for check points.	Demonstration. Lecture.	Appliances. Service manuals.	Reading service manuals and locating on the appliance check points.	Quiz of check points on the appliance from the service manual.
Operating the appliance to determine performance.	Practical work.	Appliances. Service manuals.	Operate the appliance under normal working conditions.	Observe the performance of the appliance.
Explaining the basic operation of the appliance.	Demonstration. Lecture. Practical work.	An appliance: Toaster Coffee maker Room heater	Students lecture to their group, explaining the operation of an appliance.	Listen for misinformation.

TASK NO. 9: OBSERVING THE SYMPTOMS TO DETERMINE THE DEFECT(S) IN SMALL MOTOR DRIVEN APPLIANCES

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting the customer's complaint concerning the malfunction of the appliance.	Lecture/participation by student. Skit (students).	Customers with appliance: Coffee maker Room heater Toaster	Students act out skit with customer in deciding from his complaint the malfunction of the appliance. List possible failure causes.	Cross-check complaint list and possible causes.
Writing the malfunctions of the appliance on a service ticket.	Practical work.	Service tickets. Textbook: Electrical Appliance Servicing, William H. Crouse, T.C.S., Scranton, P., Serial 6729A (1965), p. 28.	Fill out service record ticket.	Check that all entries are correct.
Explaining the basic operation of the appliance.	Demonstration. Film.	Cut-away" overlays. Film: "Electromagnets."	Observe film and demonstration.	Written explanation of appliance operation.
Visually inspecting for obvious defects in the cord and plug.	Demonstration. Practical work.	Faulty cord and plug. Good cord and plug.	Determine a defect in the cord and plug from observation.	Test students ability to recognize a defect in cord and plug and to recognize a good one.
Visually inspecting for obvious defects in the appliance.	Demonstration. Practical work.	Appliance with malfunction. Broken linkage, etc.	Examining appliances to determine malfunction.	Ask students to identify faulty area or component.
Operating the appliance in order to observe the malfunction.	Practical work.	Faulty appliances.	Plug the appliance into a convenience receptical. Note malfunction and compare with customer complaint.	Observe student work.

TASK NO. 10: DISASSEMBLING SMALL ELECTRIC MOTOR APPLIANCES FOR TESTING AND REPAIRING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks to determine: (a) Installation procedures & techniques. (b) Service procedures. (c) Type, function & rating of defective part. (d) Electrical supplies. (e) Special service tools. (f) Electrical code.	Demonstration. Lecture. Practical work.	Manufacturer's service manual. Parts Lists. Textbooks: Major Appliance Servicing, Percy T. Brockwell, Jr. McGraw-Hill Book Co, 1958, New York: N.Y. , p. 211. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 113. Electrical Appliance Servicing, William H. Crouse, I.C.S., Scranton, Pa., Serial 6729A (1965), p. 1-32.	Reading drawings, schematics, specifications. Identifying components from drawings. Identifying special tools. Writing the specifications for defective parts.	Written quiz on reference material. Write an order for a replacement part. Observe the proper use of special tools.
Selecting the proper type and Size of: (a) Screwdrivers (b) Pliers (c) Wrenches (d) Cutt ers (e) Nutdrivers	Demonstration. Practical work.	Screwdrivers. Pliers. Wrenches. Nutdrivers. Textbook: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, p. 113.	Examining different types of: a. Screwdrivers b. Pliers. c. Wrenches. d. Nutdrivers. Using the tools for the purpose for which they were intended.	Observe the correct usage of tools.
Applying the proper care, maintenance , and storage of tools.	Demonstration. Practical work.	"ABC's of Handtools," published by General Motors.	Maintaining tools in a working condition.	Inspection of care, maintenance, and storage of tools.
Recognizing the proper methods of holding wrenches.	Demonstration. Practical work.	Assorted hand wrenches.	Holding, handling, and using tools correctly.	Observe students at work.
Applying the proper methods of holding work.	Demonstration. Practical work.	Holding devices: clamps vices	Securing work for safe operation.	Student demonstrates his ability to secure work to prevent accidents and facilitate repairs.
Applying methods of holding pliers for pulling, pressing, and twisting.	Demonstration.	Pliers.	Twisting, pulling, and pressing with pliers.	Observe students.
Recognizing the results of using pliers for removing nuts and bolts.	Demonstration.	Pliers. Nuts and bolts.	Remove nut from bolt with pliers and observe damage.	Observe the correct usage of pliers.

Task No. 10 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Determining the proper methods of stripping wire.	Demonstration. Practical work.	Wire strippers. Wire. Textbook: Reliable Electrical Connections, Technology Handbook, 3rd edition. NASA SP-5002, George C. Marshall Space Flight Center, Huntsville, Alabama, Dec. 1963, James A. Gay, Jr.	Removing the insulation from wires with strippers.	Observe students correctly strip wire.
Applying the proper procedures for cutting with diagonal cutters.	Demonstration. Practical work.	Cutters. Wire.	Cutting wire with diagonal cutters.	Observe students cutting correctly.
Recognizing the various types of fastening devices: (a) Threaded fasteners Bolt and nut Cap screw Machine screw Set screw Sheet metal & self-tapping screw Stud bolt (b) Keys, rivets & springs (c) Cotter pins & shear pins (d) Retaining rings	Demonstration. Practical work.	Various fastening devices.	Working with various fastening devices to determine the characteristics of each.	Observe the use of fastening devices. Quiz on the uses of different fastening devices.
Recognizing the various types and sizes of washers.	Demonstration. Display.	Assortment of various washers.	Determine the correct usage of washers.	Observe the proper application of washers.
Applying the proper methods of removing threaded fasteners.	Demonstration. Practical work.	Handtools: Wrenches Nutdrivers Screwdrivers Threaded fasteners	Install threaded fasterners in the appliance.	Observe the correct usage of tools as to not damage threaded fasteners.
Recognizing the difference between right and left hand threads.	Demonstration. Practical work.	Parts manual. Service manuals. Left hand threads. Right hand threads.	Identify left and right hand threads. Read service manual and parts manual for application of left hand threads.	Test students ability to read service manual to determine location of left hand threads.

Task No. 10 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Applying the proper safety precautions: (a) Wearing safety shoes with non-conducting soles. (b) Removing jewelry & items of clothing with metal fasteners. (c) Avoiding work situations where moisture is present. (d) Disconnecting the appliance before attempting servicing. (e) Properly grounding appliance.	Demonstration. Lecture. Film.	Defective appliance. V.O.M. Textbooks: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, p. 265. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc., (1965), p. 85. Film: "The Factory: How a Product is Made," borrow from Encyclopedia Britannica.	Observe safety rules and regulations. Listen to film. Watch demonstration of effects of shorted, ungrounded appliance.	Quiz on film. Quiz on safety rules and regulations.
Selecting the proper types and sizes and tip soldering gun.	Demonstration. Practical work.	Soldering guns. Tip assortment. Textbook: Reliable Electrical Connections, Technology Handbook, 3rd edition. NASA SP-5002, George C. Marshall, Space Flight Center, Huntsville, Alabama, Dec. 1963, James A. Gay, Jr.	Examining soldering guns and irons to determine the best tip for the particular job.	Check to see the soldering gun and tip to fit the job.
Recognizing the importance of tinning the tip of the soldering iron.	Demonstration. Practical work.	Soldering guns. Solder (rosin core). Flux. Steel wool.	Students will tin the soldering gun tip to insure the transmission of heat.	Inspect the tinned soldering tip.
Determining the correct composition of solders to be used on the appliance.	Demonstration. Lecture.	Copper wire: Solid Stranded Soldering gun. Rosin core solder. Soldering paste.	Determining the solder for copper wire by virtue of the core, rosin.	Observe the correct solder used on copper wire.
Recognizing the importance and purposes of flux when soldering.	Demonstration. Lecture.	Soldering flux.	Selecting the proper fuix for appliance wiring.	Observe the correct usage of flux depending on the job.
Applying the proper methods of transferring heat to work and applying solder to the joint.	Demonstration.	Overlays of correct soldering methods. V.O.M. Textbook: Electrical Appliance Servicing, William H. Crouse, T.C.S., Scranton, Pa., Serial 6729A (1965), p. 12.	Students will solder wires correctly.	Examine correctly soldered joints. Look for "cold" joints. Check with V.O.M. (resistance).

Task No. 10 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Removing fasteners and cover plates of the appliance with the appropriate tools.	Demonstration. Practical work.	Service manuals. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), Chapter 1.	Students will correctly, according to the reference, remove the cover plates from the appliance.	Observe students using the service manuals.
Removing soldered connections with a soldering iron.	Demonstration. Practical work.	Soldering gun. Soldering aid. Soldered circuit.	Students will remove soldered joints with a soldering gun and soldering aid.	Observe the correct procedures used in removing a soldered joint.

TASK NO. 11: ISOLATING THE MECHANICAL DEFECTS TO A PARTICULAR SECTION OF THE SMALL ELECTRIC MOTOR APPLIANCES

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks to determine: (a) Installation procedures & techniques. (b) Service procedures. (c) Type, function and rating of defective part. (d) Electrical supplies. (e) Special service tools. (f) Electrical code.	Demonstration. Lecture. Practical work.	Manufacturer's service manual. Parts Lists. Textbooks: Major Appliance Servicing, Percy T. Brockwell, Jr., McGraw-Hill Book Co., 1958, New York, N.Y. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 113. Electrical Appliance Servicing, William H. Crouse, I.C.S., Scranton, Pa., Serial 6729A (1965), pp. 1-32.	Reading drawings, schematics, specifications, and catalogues. Identifying components from drawings. Identifying special tools. Writing the specification for defective parts.	Written quiz on reference material. Write an order for a replacement part. Observe the proper use of special tools.
Reading the manufacturer's service reference chart for possible causes of the trouble.	Independent reading.	Service reference Charts for various appliances.	Reading trouble shooting chart to determine cause of failure of the appliance.	Quiz on service reference charts to check reading comprehension of students.
Computing Ohm's Law to determine amperage, voltage and resistance.	Practical work.	Quiz on Ohm's Law.	View film. Computing Ohm's Law problems.	Quiz on Ohm's Law.
Explaining the electron theory of current flow in the appliance.	Films.	Films: "Introduction to Electricity," borrow from Cornet Films, Wilmette, Ill. "Basic Electricity - The Electron Theory," borrow from Encyclopedia Britannica (5 min.).	View film.	Quiz on film.
Applying the proper method of checking for electrical grounds.	Demonstration. Practical work.	Appliance (small). V.O.M.	Inspecting the appliance with electrical meters to determine grounds.	Observe the correct application of electrical meters.
Applying the proper procedure for tracing electrical circuits.	Demonstration. Lecture. Practical work.	Appliances. Schematics. V.O.M.	Students listen to and follow lecture, demonstration. Students will identify components in the appliance after locating them on a schematic.	Ask students to identify components on the appliance from a schematic.
Applying the proper safety precautions: (a) Wearing safety shoes with non-conducting soles. (b) Removing jewelry & items of clothing with metal fasteners. (c) Avoiding work situations where moisture is present. (d) Disconnecting the appliance before attempting servicing. (e) Properly grounding appliance.	Demonstration. Lecture. Film.	Defective appliance. V.O.M. Textbooks: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, p. 265. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 95.	Students observe safety rules and regulations. Listen to film on safety. watch demonstration of effects of shorted, ungrounded appliance.	Quiz on film. Quiz on safety rules and regulations.

Task No. 11 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Visually inspecting for obvious defects in the appliance.	Demonstration. Practical work.	Appliance with malfunction. Broken linkage, etc.	Examining appliances to determine malfunction.	Ask students to identify faulty area or component.
Inspecting the appliance for fects with a continuity tester or volt-Ohm meter.	Demonstration. Practical work.	Continuity tester. V.O.M. Small hearing element. Appliance - good and defective switchs.	Testing the componetns of appliances with a continuity tester.	Observe students ability to determine defective components.
Eliminating the possible cause of defects until the particular defective section of the appliance is found.	Practical work.	Service manuals. Appliances. V.O.M. Continuity tester. Assorted tools.	Students will isolate each section or component of the appliance and test each with appropriate meters.	Observe students ability to determine defective component through testing.
Connecting electrical meters in the proper manner.	Demonstration. Practical work.	Appliances. Electrical meters: V.O.M. Ammeter - probe Continuity tester Textbook: Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Students will connect meters in a circuit according to manual.	Test on student performance in connecting electrical meters.

TASK NO. 12: ISOLATING THE ELECTRICAL DEFECT(S) TO A PARTICULAR SECTION OF THE SMALL ELECTRIC MOTOR APPLIANCES

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks to determine: (a) Installation procedures & techniques. (b) Service procedures. (c) Type, function & rating of defective part. (d) Electrical supplies. (e) Special service tools. (f) Electrical code.	Demonstration. Lecture. Practical work.	Manufacturer's service manual. Parts Lists. Textbooks: Major Appliance Servicing, Percy T. Brockwell, Jr., McGraw-Hill Book Co., 1958, New York, N.Y., p. 211. How to Repair Small Appliance, Jack Darr, Howard W. Sams & Co., Inc. (1965) p. 113. Electrical Appliance Servicing, William H. Crouse, T.C.S., Scranton, Pa., Serial 6729A (1965), pp. 1-32.	Reading drawings, schematics, specifications, catalogues. Identifying components from drawing. Identifying special tools. Writing the specifications for defective parts.	Written quiz on reference material. Write an order for a replacement part. Observe the proper use of special tools.
Interpreting the meter readings to determine the condition of components.	Demonstration. Practical work.	Heating appliance element. V.O.M. Continuity tester. Textbook: How To Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, Chapter 16.	Reading meters connected to components to determine their location. Hooking up the V.O.M. to components.	Quiz on identification of faulty components as detected with instruments.
Computing Ohm's Law to determine amperage, voltage and resistance.	Practical work.	Quiz on Ohm's Law.	Computing Ohm's Law problems.	Quiz on Ohm's Law.
Explaining the electron theory of current flow in the appliance.	Film.	Film: "Magnetism," 16 min., borrow from Encyclopedia Britannica.	Listening to film.	Quiz on film.
Applying the proper procedures for checking for electrical grounds.	Demonstration. Practical work.	Appliance, small. V.O.M.	Inspect the appliances with electrical meters to determine grounds.	Observe the correct application of electrical meters.
Applying the proper procedures for tracing electrical circuits.	Demonstration. Lecture. Practical work.	Appliance. Schematics. V.O.M.	Listen to and follow lecture, demonstration. Identify components in the appliances after locating them on a schematic.	Ask students to identify components on the appliance from a schematic.
Determining the correct methods of inspecting, checking, calibrating electrical meters to known standards.	Demonstration. Practical work.	Meters. Manuals. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Calibrating meters according to the manual peculiar to the meter.	Check meters for correct calibration.

Task No. 12 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the importance of proper connection of appropriate electrical meters.	Demonstration. Practical work.	Appliances. V.O.M. Continuity tester. Textbooks: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, p. 273. Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Connecting meters in a circuit correctly.	Observe the connection of meters in a circuit by students.
Selecting the appropriate electrical meters for the job to be done: (a) Voltmeters (b) Ampmeter or amp-probe (c) Continuity tester (d) Volt-Ohm meter (V.O.M.)	Demonstration.	Voltmeters. Ampmeter. Continuity tester. V.O.M. Textbooks: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, p. 264. Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill., p. 2-3.	Determining test to be made and select a meter accordingly.	Quiz on identification of meters and their function.
Applying the proper care, maintenance, and storage of electrical meters.	Demonstration. Practical work.	Meters. Manuals. Textbooks: How to Repair Major Appliances, Ernest Tricomi, Howard W. Sams & Co., Inc. (1965), Chapter 1. Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill. p. 2-3.	Maintaining meters in proper working condition.	Observe the storage and maintenance of electrical meters.
Applying the proper safety precautions: (a) Wearing safety shoes with non-conducting soles. (b) Removing jewelry & items of clothing with metal fasteners. (c) Avoiding work situations where moisture is present. (d) Disconnecting the appliance before attempting servicing. (e) Properly grounding appliance.	Demonstration. Lecture. Film.	Defective appliance. V.O.M. Textbooks: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, p. 265. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 95. Film: "The Factory: How a Product is Made," borrow from Encyclopedia Britannica.	Students will observe safety rules and regulations. Listen to film on safety. Watch demonstration of effects of shorted, ungrounded appliance.	Quiz on film. Quiz on safety rules and regulations.
Visually inspecting for obvious defects in the cord and plug on the appliance.	Demonstration. Practical cord.	Faulty cord and plug. Good cord and plug.	Determining a defect in the cord and plug from observation.	Test students ability to recognize a defect in a cord or plug and to recognize a good one.

Task No. 12 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Connecting electrical meters in the proper manner.	Demonstration. Practical work.	Appliances. Electrical meters: V.O.M. Ammeter and probe Continuity tester. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Connecting meters in a circuit according to manual.	Performance test in connecting electrical meters.
Inspecting the switch in the appliance for defects with a continuity testers or the appropriate electrical meter.	Demonstration. Practical work.	Continuity tester. V.O.M. Small heating element appliance. Good and defective switch.	Testing switches with meters and testers to determine their condition.	Observe students ability to recognize a defective switch.
Inspecting the internal wiring connections for defects with a continuity tester or the appropriate electrical meter.	Practical work.	Continuity tester. V.O.M. Small appliances. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Testing connections for defects with meters.	Observe students ability to locate defective electrical connections with meters.
Inspecting for defective accessories: (a) Heaters. (b) Brushes. (c) Magnets. (d) Cutters. (e) Blades. (f) Batteries.	Practical work.	Service manuals. V.O.M. Good and defective accessories.	Determining good and defective accessories from an assortment.	Observe students at work.
Inspecting the small meter appliance for defects.	Practical work.	Switches, controls, heating elements. Electrical meters: V.O.M. Ammeter Continuity tester Textbooks: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), Chapter 4. Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Testing components to localize the malfunction in the appliance.	Observe students ability to locate defective components with electrical meters.
Cleaning dirty components with a small brush.	Practical work.	Small brush. Components and controls. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1966), p. 95.	Cleaning components to insure proper functioning in the appliance.	Check to see that all components are properly cleaned.

TASK NO. 13: ISOLATING THE DEFECT TO A PARTICULAR COMPONENT OF THE SMALL ELECTRIC MOTOR APPLIANCE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks to determine: (a) Installation procedures & techniques. (b) Service procedures. (c) Type, function & rating of defective part. (d) Electrical supplies. (e) Special service tools. (f) Electrical code.	Demonstration. Lecture. Practical work.	Manufacturer's service manual. Parts Lists. Textbooks: Major Appliance Servicing, Percy T. Brockwell, Jr., McGraw-Hill Book Co., 1958, New York, N.Y., p. 211. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 113. Electrical Appliance Servicing, William H. Crouse, I.C.S., Scranton, Pa., Serial 6729A (1965), p. 1-32.	Reading drawings, schematics, specifications and catalogues. Identifying components from drawings. Identifying special tools. Writing the specification for defective parts.	Written quiz on reference material. Write an order for a replacement part. Observe the proper use of special tools.
Interpreting the meters, readings to determine the condition of components.	Demonstration. Practical work.	Heating element appliance. V.O.M. Continuity tester. Textbook: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, Chapter 16.	Reading meters connected to components to determine their condition. Hooking up the V.O.M. to components.	Quiz on identification of faulty components as detected with instruments.
Computing Ohm's Law to determine amperage, voltage, and resistance.	Practical work.	Quiz on Ohm's Law.	Computing Ohm's Law problems.	Quiz on Ohm's Law.
Explaining the electron theory of current flow in the appliance.	Film.	Films: "Introduction to Electricity," borrow from Cornet Films, Wilmette, Ill. "Basic Electricity - The Electron Theory," borrow from Encyclopedia Britannica (5 min.).	Listening to film.	Quiz on film.
Explaining the characteristics of series and parallel circuits used in the appliance.	Demonstration. Film.	Circuit board. Schematics. Film: "Elements of Electric Circuits," rent from Encyclopedia Britannica.	Listening to film. Making a schematic to show a series circuit and parallel circuit.	Quiz on film. Check schematics.
Applying the proper procedure for diagnosing incorrect operation or malfunction.	Demonstration. Practical work.	Service manuals. Appliances. Textbooks: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965). Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill. pp. 4-27.	Students will observe malfunction and compare to troubleshooting chart to locate defective part. Students will follow demonstration on the use of service manuals to recognize trouble spot.	Students will be asked to determine the malfunction of an appliance by the symptoms. Written or oral exam.

Task No. 13 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Applying the proper methods of checking for electrical grounds.	Demonstration. Practical work.	Appliance, small. V.O.M.	Inspecting the appliance with electrical meters to determine grounds.	Observe the correct application of electrical meters.
Applying the proper procedure for tracing electrical circuits.	Demonstration. Lecture. Practical work.	Appliance. Schematics. V.O.M.	Listening to lecture, demonstration. Identifying components in the appliance after locating them on a schematic.	Ask students to identify components on the appliance from a shcematic.
Recognizing the importance of proper connection of appropriate electrical meters.	Demonstration. Practical work.	Appliances. V.O.M. Continuity tester. Textbooks: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, p. 273. Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Connecting meters in a circuit correctly.	Observe the connection of meters in a circuit by students.
Selecting the appropriate electrical meters for the job to be done: (a) Voltmeter. (b) Ampmeter or amp-probe. (c) Continuity tester. (d) Volt-Ohm meter (V.O.M.)	Demonstration.	Voltmeters Ampmeter Continuity tester V.O.M. Textbooks: How to Repair Electrical Appliances, Book 2 (1964) H. P. Manly, Frederick J. Drake & Co., Publishers, p. 264. Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill., p. 2-3.	Students will determine test to be made and select a meter accordingly.	Quiz on identification of meters and their function.
Applying the proper care, maintenance, and storage of electrical meters.	Demonstration. Practical work.	Textbooks: How to Repair Major Appliances, Ernest Tribbal, Howard W. Sams & Co., Inc. (1966), Chapter 1. Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill., p. 2-3.	Maintaining meters in proper working condition.	Observation of storing and maintaining electrical meters.
Determining the correct methods of inspecting, checking, calibrating electrical meters to known standards.	Demonstration. Practical work.	Meters. Manuals. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Calibrating meters according to the manual peculiar to the meter.	Check meters for correct calibration.

Task No. 13 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Applying the proper safety precautions: (a) Wearing safety shoes with non-conducting soles. (b) Removing jewelry & items of clothing with metal fasteners. (c) Avoiding work situations where moisture is present. (d) Disconnecting the appliance before attempting servicing. (e) Properly grounding appliance.	Demonstration. Lecture. Film.	Defective appliance. V.O.M. Textbooks: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, p. 265. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 95. Film: "The Factory: How a Product is Made," borrow from Encyclopedia Britannica.	Observe safety rules and regulations. Listen to film.	Quiz on film. Quiz on safety rules and regulations.
Inspecting the switch in the small electric heating appliance for defects with a continuity tester or the appropriate electrical meter.	Demonstration. Practical work.	Continuity tester. V.O.M. Small heating element appliance. Good and defective switch.	Testing switches with meters and testers to determine the condition of components.	Determine students ability to recognize a defective switch.
Inspecting the internal wiring connections for defects with a continuity tester or the appropropriate electrical meter.	Practical work.	Continuity testers. V.O.M. Small appliances. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Testing connections for defects with meters.	Observe ability to locate defectiv_ ..rical connections with meters.
Visually inspecting for obvious defects in the cord and plug on the appliance.	Demonstration. Practical work.	Faulty cord and plug. Good cord and plug.	Determining a defect in the cord or plug from observation.	Observe students ability to recognize a defect in cord and plug.
Connecting electrical meters in the proper manner.	Demonstration. Practical work.	Appliances. Electrical meters: V.O.M. Ammeter - probe Continuity tester. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Connecting meters in a circuit according to the manual.	Performance test on connecting electrical meters.

Task No. 13 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Inspecting for defective accessories: (a) Blanket and pad material. (b) Plastic foot and handles. (c) Insulation. (d) Pilot lights. (e) Grill plates.	Demonstration. Practical work.	Defective appliance accessories. V.O.M.	Examining each accessory visually and with a V.O.M. as required to determine defects.	Observe the use of meters. Check students ability to recognize defective components.
Inspecting for defective capacitors, resistors and thermostats.	Demonstration. Practical work.	Good and defective: Capacitors Resistors Thermostats V.O.M.	Students will make test of different components to determine their condition.	Test students ability to separate good and bad components with meters.
Cleaning dirty components with a small brush.	Practical work.	Small brushes. Components and controls. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams and Co., Inc. (1966), p. 95.	Cleaning components to insure proper functioning in the appliance.	Check to see that all components are properly cleaned.

TASK NO. 14: REPLACING THE DEFECTIVE PART(S) OF THE SMALL ELECTRIC MOTOR APPLIANCES

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks to determine: (a) Installation procedures & techniques. (b) Service procedures. (c) Type, function & rating of defective part. (d) Electrical supplies. (e) Special service tools. (f) Electrical code.	Demonstration. Lecture. Practical work.	Manufacturer's service manual. Parts Lists. Textbooks: Major Appliance Servicing, Percy T. Brockwell, Jr., McGraw-Hill Book Co. (1958), New York, N.Y. p. 211. How to Repair Small Appliance, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 113. Electrical Appliance Servicing, William H. Crouse, I.C.S., Scranton, Pa., Serial 6729A (1965), pp. 1-32.	Reading drawings, schematics, specifications and catalogues. Identifying components from drawings. Identifying special tools. Writing the specification for defective work.	Written quiz on reference material. Write an order for a replacement part. Observe the proper use of special tools.
Selecting the proper type and size of: (a) Screwdrivers. (b) Pliers (c) Wrenches. (d) Cutters. (e) Nutdrivers.	Demonstration. Practical work.	Screwdrivers. Pliers. Wrenches. Nutdrivers. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams and Co., Inc. (1965), p. 113.	Examining different types of: a. Screwdrivers. b. Pliers. c. Wrenches. d. Nutdrivers. Using the tools correctly.	Observe the usage of tools.
Applying the proper care, maintenance, and storage of tools.	Demonstration. Practical work.	"ABC's of Handtools, published by General Motors.	Maintaining tools in working condition.	Inspection of care, maintenance, and storage of tools.
Recognizing the proper methods of holding wrenches.	Demonstration. Practical work.	Assorted hand wrenches.	Holding, handling, and using tools correctly.	Observe students at work.
Applying the proper methods of holding the work.	Demonstration. Practical work.	Holding devices: clamps vices	Securing work for safe operation.	Observe students at work.
Applying methods of holding pliers for pulling, pressing, and twisting.	Demonstration.	Pliers.	Twisting, pulling, and pressing with pliers.	Observation.
Recognizing the results of using pliers for removing nuts and bolts.	Demonstration.	Pliers. Nuts and bolts.	Remove nut from bolt with pliers and observe damage.	Observe students at work.
Applying the proper procedures for cutting with diagonal cutters.	Demonstration. Practical work.	Cutters. Wire.	Cutting wire with diagonal cutters.	Observe students.

Task No. 14 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Determining the proper methods of stripping wire.	Demonstration. Practical work.	Wire strippers. Wire. Textbook: Reliable Electrical Connections, Technology Handbook, 3rd edition. NASA AP-5002, George C. Marshall Space Flight Center, Huntsville, Alabama, Dec. 1963. James A. Gay, Jr.	Removing the insulation from wires with strippers.	Observe students.
Selecting the proper type, size and tip soldering gun.	Demonstration. Practical work.	Soldering guns. Tip assortment. Textbook: Reliable Electrical Connections, Technology Handbook, 3rd edition. NASA SP-5002, George C. Marshall Space Flight Center, Huntsville, Alabama, Dec. 1963, James A. Gay, Jr.	Examining soldering guns and irons to determine the best tip for the particular job.	Check to see the soldering gun and tip fit the job.
Recognizing the importance of tinning the tip of the soldering iron.	Demonstration. Practical work.	Soldering guns. Solder (rosin core). Flux. Steel wool.	Students will tin the soldering gun tip to insure the transmission of heat.	Inspect the tinned soldering tip.
Determining the correct composition of solder to be used on the appliance.	Demonstration. Lecture.	Copper wire: Solid Stranded Soldering gun. Rosin core solder. Soldering paste.	Determining the solder for copper wire by virtue of the core, rosin.	Observe the correct solder used on copper wire.
Recognizing the importance and purposes of flux when soldering.	Demonstration. Lecture.	Soldering flux.	Selecting the proper flux for appliance wiring.	Observe the correct usage of flux depending on the job.
Applying the proper method of transferring heat to work and applying solder to the joint.	Demonstration.	Overlays of correct soldering methods. V.O.M. (for evaluation). Textbook: Electrical Appliance Servicing, William H. Crouse, T.C.S., Scranton, Pa., Serial 6729A (1965), p. 12.		
Recognizing the various types of fastening devices: (a) Threaded fasteners Bolt and nut Cap screw Machine screw Set screw Sheet metal & self-tapping screw Stud bolt (b) Keys, rivets, and springs. (c) Cotter pins and shear pins. (d) Retaining rings.	Demonstration. Practical work.	Various fastening devices.		

Task No. 14 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the various types and uses of washers.	Demonstration. Display.	Assortment of various washers.	Student determines the correct usage of washers.	Observe the proper application of washers.
Applying the proper method of installing threaded fasteners.	Demonstration. Practical work.	Handtools: Wrenches Nutdrivers Screwdrivers Threaded fasteners.	Installing threaded fasteners to the appliance.	Observe the correct usage of tools as to not damage threaded fasteners.
Recognizing the difference between right hand and left hand threads.	Demonstration. Practical work.	Parts manuals. Service manuals. Left hand threads. Right hand threads.	Student will identify left and right hand threads. Read service manual and parts manual for application of left hand threads.	Test students ability to read service manual to determine location of left hand threads.
Applying the proper safety precautions: (a) Wearing safety shoes with non-conducting soles. (b) Removing jewelry & items of clothing with metal fasteners. (c) Avoiding work situations where moisture is present. (d) Disconnecting the appliance before attempting servicing. (e) Properly grounding appliance.	Demonstration. Lecture. Film.	Defective appliance. V.O.M. Textbooks: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, p. 265. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 95. *Film: "The Factory: How a Product is Made,"* borrow from Encyclopedia Britannica.	Observe safety rules and regulations. Listen to film.	Quiz on film. Quiz on safety rules.
Cleaning all dirty components with a small brush.	Practical work.	Small brushes. Components and controls. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 95.	Cleaning components to insure proper functioning.	Check components visually.
Dressing the contacts on plug-in type elements with abrasive cloth.	Demonstration. Practical work.	Heating elements. Abrasive cloth. Service manual. V.O.M.	Cleaning contacts.	Examine cleaned parts. Test with V.O.M. (resistance).
Soldering wires and electrical connections with a soldering iron.	Demonstration. Practical work.	Soldering iron. Soft solder. Flux. Appliances Wire (stranded) Wire strippers Textbook: Reliable Electrical Connections, Technology Handbook, 3rd edition, pp. 21-28. NASA SP-5002, George C. Marshall Space Flight Center, Huntsville, Alabama, Dec. 1963, James A. Gay, Jr.	Students will make soldered connections as perscribed in Reliable Electrical Co Connections, Technology Handbook, 3rd edition, pp. 21-28.	Inspect the soldered connections for cold joints and excessive heat.

TASK NO. 15: TESTING THE OPERATION OF THE REPAIRED SMALL ELECTRIC MOTOR APPLIANCES

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting the meter readings to determine the condition of components.	Demonstration. Practical work.	Heating element appliances. V.O.M. Continuity tester. Textbook: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, Chapter 16.	Connecting meters in a circuit correctly.	Observe the connection of meters in a circuit by students.
Computing Ohm's Law to determine amperage, voltage and resistance.	Practical work.	Quiz on Ohm's Law.	Students will determine test to be made and select a meter accordingly.	Quiz on identification of meters and their function.
Explaining the characteristics of series and parallel circuits used in the appliance.	Demonstration. Film.	Circuit board. Schematics. Film: "Elements of Electric Circuits," rent from Encyclopedia Britannica.	Listening to film. Making a schematic to show a series circuit and parallel circuit.	Quiz on film. Check schematics.
Explaining the various methods of heat transfer.	Demonstration.	Soldering iron. Wire. Terminals. Textbook: Reliable Electrical Connections, Technology Handbook, 3rd edition, p. 8. NASA SP-5002, George C. Marshall Space Flight Center, Huntsville, Alabama, Dec. 1963, James A. Gay, Jr.	Students will follow demonstration of the absorption of heat to prevent damage to components. Students will note the rate of solder melting and location of soldering iron.	Have students display their knowledge of heat transfer in soldering.
Explaining the function of conductors and insulators.	Demonstration. Practical work.	Assorted insulators and types of wire. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams and Co., Inc. (1965), p. 65.	Determining type, size, and insulation of conductors. Recognizing insulators of different types.	Written quiz.
Recognizing the importance of proper connection of appropraite electrical meters.	Demonstration. Practical work.	Appliances. V.O.M. Continuity tester. Textbooks: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, p. 273. Simplified Electrical Appliance Servicing, Arthur Stephens, Simpson Electric Company (1966), Chicago, Ill.	Reading meters connected to components to determine their condition. Hooking up the V.O.M. to components.	Quiz on identification of faulty components as detected with instruments.

Task No. 15 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting the appropriate electrical meters for the job to be done: (a) Voltmeter. (b) Ampmeter or amp-probe. (c) Continuity tester. (d) Volt-Ohm meter (V.O.M.).	Demonstration.	Voltmeters. Ampmeter. Continuity tester. Textbooks: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, p. 264. Simplified Electrical Appliance Servicing, Author Stephons, Simpson Electric Company (1966), Chicago, Ill., p. 2-3.	Computing Ohm's Law problems.	Quiz on Ohm's Law.
Applying the proper care, maintenance, and storage of electrical meters.	Demonstration. Practical work.	Textbooks: How to Repair Major Appliances, Ernest Tricomi, Howard W. Sams & Co., Inc. (1965), Chapter 1. Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill., p. 2-3.	Maintaining meters in proper working condition.	Observe the storage and maintenance of electrical meters.
Determining the correct method of inspecting, checking, calibrating electrical meters to known standards.	Demonstration. Practical work.	Meters. Manuals. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Calibrating meters according to the manual peculiar to the meter.	Check meters for correct calibration.
Connecting electrical meters in the proper manner.	Demonstration. Practical work.	Appliances. Electrical meters: V.O.M. Ampmeter - probe. Continuity tester. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Connecting meters in a circuit according to manual.	Student performance in connecting electrical meters.
Inspecting the appliance for defects with a continuity tester or the appropriate electrical meter.	Demonstration. Practical work.	Continuity tester. V.O.M. Small heating element appliance. Good and defective switch.	Checking assembled appliance with V.O.M. and/or continuity tester.	Observe operation of assembled appliance.

TASK NO. 16: REASSEMBLING THE REPAIRED SMALL ELECTRIC MOTOR APPLIANCES

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics, and handbooks to determine: (a) Installation procedures & techniques. (b) Service procedures. (c) Type, function & rating of defective part. (d) Electrical supplies. (e) Special service tools. (f) Electrical code.	Demonstration. Lecture. Practical work.	Manufacturer's service manual. Parts Lists. Textbooks: Major Appliance Servicing, Percy T. Brockwell, Jr., McGraw-Hill Book Co., 1958, New York, N.Y., p. 211. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 113. Electrical Appliance Servicing, William H. Crouse I.C.S., Scranton, Pa., Serial 6729A (1965), pp. 1-32.	Reading drawings, schematics, specifications and catalogues. Identifying components from drawings. Identifying special tools. Writing the specifications for defective parts.	Written quiz on reference material. Write an order for a replacement part. Observe the proper use of special tools.
Recognizing the various parts of the appliance.	Demonstration. Practical work.	Service manuals. Appliances.	Locating components of the appliance from the service manual. Identifying parts by name with aid of service manual.	Quiz on "Name that Part."
Selecting the proper type and size of: (a) Screwdrivers. (b) Pliers. (c) Wrenches. (d) Cutters. (e) Nutdrivers.	Demonstration. Practical work.	Screwdrivers. Pliers. Wrenches. Nutdrivers. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 113.	Examining different types of: a. Screwdrivers. b. Pliers. c. Wrenches. d. Nutdrivers.	Observe the correct usage of tools.
Recognizing the proper methods of holding wrenches.	Demonstration. Practical work.	Assorted hand wrenches.	Using the tools for the purpose for which they were intended.	Teacher observation.
Applying the proper methods of holding the work.	Demonstration. Practical work.	Holding devices: Clamps Vices	Securing work for safe operation.	Observation.
Applying methods of holding pliers for pulling, pressing, and twisting.	Demonstration.	Pliers.	Holding, handling, and using tools correctly.	Observe students at work.
Applying the proper procedure for cutting with diagonal cutters.	Demonstration. Practical work.	Cutters. Wire.	Cutting wire with diagonal cutters.	Observe students cutting correctly.

Task No. 16 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the results of using pliers for removing nuts and bolts.	Demonstration.	Pliers. Nuts and bolts.	Remove nut from bolt with pliers and observe damage.	Observe the correct usage of pliers.
Determining the proper method of stripping wire.	Demonstration. Practical work.	Wire strippers. Wire. Textbook: Reliable Electrical Connections, Technology Handbook, 3rd edition, p. 3. NASA SP-5002, George C. Marshall Space Flight Center, Huntsville, Alabama, Dec. 1963, James A. Gay, Jr.	Removing the insulation from wire with strippers.	Observe students correctly strip wire.
Explaining the importance of observing recommended procedures when tightening down plates, covers, and flanges.	Demonstration. Practical work.	Handtools. Small heating element appliance. Service manuals.	Installing cover plates on small appliances according to service manual procedures.	Observe the installation procedures.
Applying the proper safety precautions: (a) Wearing safety shoes with non-conducting soles. (b) Removing jewelry & items of clothing with metal fasteners. (c) Avoiding work situations where moisture is present. (d) Disconnecting the appliance before attempting servicing. (e) Properly grounding appliance.	Demonstration. Lecture. Film.	Defective appliance. V.O.M. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 95. Film: "The Factory: How a Product is Made," borrow from Encyclopedia Britannica.	Observe safety rules and regulations. Listen to film.	Quiz on rules and regulations. Quiz on film.
Replacing fasteners and cover plates with appropriate tools.	Demonstration. Practical work.	Handtools. Cover plates. Service manuals.	Installing cover plates on appliances.	Inspect appliance for correct usage of tools and assembly.
Cleaning all dirty components with a small brush.	Practical work.	Small brushes. Components and controls. Textbook: How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1966), p. 95.	Cleaning components to insure proper functioning.	Observe cleaned components.

TASK NO. 17: RETESTING THE REPAIRED SMALL ELECTRIC MOTOR APPLIANCES

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogues, service manuals, schematics and handbooks to determine: (a) Installation procedures & techniques. (b) Service procedures. (c) Type, function & rating of defective part. (d) Electrical supplies. (e) Special service tools. (f) Electrical code.	Demonstration. Practical work. Lecture.	Manufacturer's service manual. Parts Lists. Textbooks: Major Appliance Servicing, Percy T. Brockwell, Jr., McGraw-Hill Book Co, 1958, New York, N.Y., p. 211. How to Repair Small Appliances, Jack Darr, Howard W. Sams & Co., Inc. (1965), p. 113. Electrical Appliance Servicing, William H. Crouse, I.C.S., Scranton, Pa., Serial 6729A (1965), pp. 1-32.	Reading drawings, schematics, specifications, and catalogues. Identifying components from drawings. Identifying special tools. Writing the specifications for defective parts.	Written quiz on reference material. Write an order for a replacement part. Observe the proper use of speical tools.
Interpreting meter readings to determine condition of components.	Demonstration. Practical work.	Heating element appliance. V.O.M. Continuity tester. Textbook: How to Repair Electrical Appliances, Book 2 (1964), H.P. Manly, Frederick J. Drake & Co., Publishers, Chapter 16.	Reading meters connected to components to determine their condition. Hooking up the V.O.M. to components.	Quiz on identification of faulty components as detected with instruments.
Explaining the basic operation of the appliance.	Demonstration. Practical work. Lecture.	An appliance: Toaster Coffee maker Room heater	Students lecture to their group, explaining the operation of an appliance.	Listen for misinformation.
Recognizing the importance of proper connection of appropriate electrical meters.	Demonstration. Practical work.	Appliances. V.O.M. Continuity tester. Textbooks: How to Repair Electrical Appliances, Book 2 (1964), H. P. Manly, Frederick J. Drake & Co., Publishers, p. 273. Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Connecting meters in a circuit correctly.	Observe the connection of meters in a circuit by students.
Applying the proper care, maintenance, and storage of electrical meters.	Demonstration. Practical work.	Textbooks: How to Repair Major Appliances, Ernest Tricomi, Howard W. Sams & Co., Inc. (1966), Chapter 1. Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill., p. 2-3.	Maintaining meters in proper working condition.	Observe the storage and maintenance of electrical meters.

Task No. 17 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Determining the correct method of inspecting, checking, calibrating electrical meters to known standards.	Demonstration. Practical work.	Meters. Manuals. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Calibrating meters according to the manual peculiar to the meter.	Check meters for correct calibration.
Operating the appliance to determine performance.	Practical work.	Faulty appliances.	Operating appliance according to service manual.	Observation.
Connecting electrical meters in the proper manner.	Demonstration. Practical work.	Appliances. Electrical meters: V.O.M. Ampmeter - probe. Continuity tester. Textbook: Simplified Electrical Appliance Servicing, Arthur Stephons, Simpson Electric Company (1966), Chicago, Ill.	Connecting V.O.M. to measure applied voltages.	Observation and practical exam.
Inspecting the appliance for defects with a continuity tester or the appropriate electrical meter.	Film.	Film: "Home Electrical Appliances," 11 min., borrow from Encyclopedia Britannica.	View film. Test appliance with appropriate meters.	Quiz on film. Observe student.

OCCUPATIONAL INFORMATION UNIT FOR HOME APPLIANCE SERVICING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Employment outlook: 1. Local 2. National	Lecture - guest speaker from local employment security agency. Demonstration chart.	Speaker. Informational sheets. Publication: Occupational Outlook Handbook, U.S. Department of Labor, 1966-67 edition, Washington, D.C.: Government Printing Office, 1966. Bulletin #1450-4, U.S. Department of Labor. Flip charts.	Listening to speaker. Making notes on: Number employed Employment outlook Wage rates Job requirements	Discussion. Written quiz on employment security office. Employment trends (local and national); requirements (physical, mental); characteristics of work.
Wage scales: 1. Local a. union (1) apprentice (2) journeyman (3) masters b. non-union (1) entry wages (2) experienced 2. National a. union (1) apprentice (2) journeyman (3) masters b. non-union (1) entry wages (2) experienced	Lecture. Demonstration. Guest speaker from local union.	Transparencies to dramatize differences between union and non-union wages on the local level.	Listen to speaker. Watch and interpret transparencies. Make notes on all phases of instruction.	Check the familiarity of the student with the wage scales of both union/non-union on the local and national level.
Types of training available: 1. Apprenticeship programs 2. Technical trade schools 3. On-the-job 4. Military	Lecture. Film. Speaker. Local recruiter.	Contact area appliance dealers. Film: "Buck County Vocational-Technical Center," Williamsport, Pa. Speaker. Teacher-prepared information sheets.	Listen to speaker. Watch film. Writing for information from appliance dealers and trade schools.	Observation and discussion.
The working conditions experienced in the occupation.	Lecture - and/or guest speaker from service shop.	Publication: Occupational Outlook Handbook, U.S. Department of Labor, 1966-67 edition, Washington, D.C.: Government Printing Office, 1966. Bulletin #1450-4, Department of Labor. Local service shop.	Students will follow speaker/teacher and take notes.	Class discussion.

OCCUPATIONAL INFORMATION UNIT FOR HOME APPLIANCE SERVICING (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
The physical and mental characteristics needed for qualifications for employment.	Lecture - and/or guidance counselor.	Publication: Occupational Outlook Handbook, U.S. Department of Labor, 1966-67 edition, Washington, D.C.: Government Printing Office, 1966. Bulletin #1450-4, Department of Labor.	Listen to lecture and take notes.	Oral discussion.
Geographical location of employment.	Lecture. Demonstration.	Publication: Occupational Outlook Handbook, U.S. Department of Labor, 1966-67 edition, Washington, D.C.: Government Printing Office, 1966. Bulletin #1450-4. Transparencies.	Listen to lecture and take notes.	Class discussion.
The opportunities for advancement: Advantages and disadvantages of the occupation. The nature of the work involved in the occupation.	Lecture by local serviceman.	Publication: Occupational Outlook Handbook, U.S. Department of Labor, 1966-67 edition, Washington, D.C.: Government Printing Office, 1966. Bulletin #1450-4.	Listen to lecture and take notes.	Oral discussion.
The union involvement in the occupation.	Lecture. Local union representative and/or teacher-led discussion.	Publication: Occupational Outlook Handbook, U.S. Department of Labor, 1966-67 edition, Washington, D.C.: Government Printing Office, 1966. Bulletin #1450-4.	Listen to lecture and take part in discussion.	Oral discussion.

RADIO AND TELEVISION SERVICING

TASK NO. 1: OBSERVING THE SYMPTOMS TO DETERMINE THE DEFECTIVE STAGE OF THE RADIO

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Explaining the characteristics and function of radio waves.	Use science teacher if possible or lecture.	Chalkboard Charts Filmstrip: "Detection, Radio," USN 495 Summer St., Boston 10, Mass.	Make a wave chart in notebook showing various frequencies used in communication - radio, TV, VHF, UHF, etc. Read text. View filmstrip.	Quiz.
Explaining the function of each stage of a radio. Reading block diagram to follow stages in a radio.	Filmstrips Lecture	Radio - block diagram of the superheterodyne:filmstrip Filmstrip: "Radio Servicing Series," MGHT - 6 strips, 37 frames each. Educational Media, Index 9, McGraw-Hill, p. 154.	Take notes and keep notebook, starting with a power supply and adding on until superheterodyne is completed in block form. Read text. View filmstrip.	Written objective-type exam. Check notebooks.
Locating the different stages of a radio from the schematic diagram.	Illustrate symbols on board and use of charts or board-size schematics.	Electronic Aid modules or other teaching aids (demonstrators). Schematics.	Draw a superheterodyne schematic in notebooks. Read text.	Quiz.
Interpreting drawings, specifications. Manufacturer's catalogs, service manuals, schematics and handbooks.	Lecture Discussion	Schematics Handout - circuit symbols Service manuals	Practice locating information.	Quiz.
Applying the proper safety precautions: a. Wearing safety shoes b. Removing jewelry and clothes with metal fasteners. c. Avoding work conditions where moisture exists. d. Properly grounding the radio.	Lecture Discussion Film	Film: "Safety Precautions for the Electronics Personnel," 18 min. B & W, Order No. MU 6754, borrow from USN, Cat. No. OE - 34006 - U.S. Government Films.	Practice correct safety procedures.	Include on task I exam.
Installation procedures and techniques.	Lecture Demonstration	Solder gun and iron. Necessary hand tools. Misc. components and terminals.	Solder connections. Work with related projects to acquire knowledge and gain more experience using tools.	Teacher observation.
Recognizing obvious broken parts of the radio. Visually inspecting for obvious defects in the cord and plug of the radio.	Lecture Demonstration Class discussion	Old radios.	Practice locating obvious broken parts in old radios "fixed" by instructor.	Cover on task I exam.
Listening to the radio to locate defects.	Lecture on use or local service person is desirable.	Radios Trouble shooting charts	Practice on radios manipulated by instructor. Start trouble-shooting chart in notebook.	Oral quiz on ability to locate trouble.

TASK NO. 2: CHECKING THE TUBES IN THE SUSPECTED DEFECTIVE STAGE OF THE RADIO

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading tube chart and tube manual to determine the type and rating of the tube.	Demonstration Film	Tube tester with chart, manual to tube tester being used. Film: "Tube Tester Operation," borrow from U.S. Government Films, Order No. MN 1540-P, Cat. No. OE - 34006 (9 min. film).	Read from text (section covering this topic in text you use). Find tubes and proper ratings on tube tester chart. View film.	Quiz - oral or written.
Interpreting meter readings of tube tester to determine tube conditions. Comparing measured tube values with specifications.	Lecture Demonstration Use of local serviceman, if possible or desirable.	Tube charts. Tube tester with manual. Tube characteristic manual.	Make sample chart in notebooks with tubes provided by teacher.	Check notebook work. Quiz - oral or written. (May be included on task 2 exam) Observation.
Operating a tube tester to determine condition of tubes: a. Straightening tube pins. b. Removing tubes from the chassis by hand or tube puller. c. Testing for gassy tubes. d. Testing for shorts or open filaments.	Lecture Demonstration with a variety of tubes.	Supply of tubes. Tube tester. Tube puller.	Practice testing tubes provided by instructor - remove and replace tubes in chassis.	Allow students to demonstrate ability to test tubes and care of equipment. Teacher observation. Quiz.
Recognizing: a. The different types of tubes by observation. b. The different types of tube sockets by observation. c. The different types of tube testers.	Lecture Demonstration Film	Various types of tubes and sockets. Available charts. Film: "The Diode Principles and Application," buy from UWF, Order No. OE - 176, OE - 34006, U.S. Government Films (17 min.), B & W.	Take notes in notebook. Read in text. Make tube chart with tubes provided by the instructor.	Quiz - examine more on task 2 examination.
Explaining Ohms Law to show a relation between voltage, current, and resitance.	Lecture Demonstration Film	Chalkboard. Test panel. Multi-meter. Dry cells. Resistors (low ohmage) Film: "Ohm's Law," U.S. Government Films, Order No. TF II - 1200), borrow from Army, Cat. No. OE - 34006 (19 min.).	Read test. Do Ohm's Law problems in notebook. List formulas needed.	Written examination.
Explaining the electron theory of current flow in the radio.	Lecture: Physics teacher may be used if desirable. Film	Charts of the superheterodyne. Film: "The Electron Theory," U.S. Government Films, Cat. No. OE - 34006, MN 8016-a, borrow from USN.	Make chart of superheterodyne in block form in notebooks, indicating flow of current. Read text.	Written examination.

TASK NO 3: REMOVING THE CHASSIS FROM THE CABINET FOR EASE OF SERVICING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading the manufacturer's schematic to find the disconnect point of the antenna.	Demonstration. Lecture.	Radios Schematics	Follow on schematics as teacher explains. Read text and take notes in notebook.	Included on test covering entire task.
Disconnecting line cord from wall receptacle. Removing knobs from cabinet. Unsoldering antenna leads. Removing fasteners holding the chassis to the cabinet using proper tools.	Demonstration.	Soldering gun and solder Appropriate Tools: Nut Drivers Screwdrivers Long nose pliers Radios	Practice on radios provided by instructor.	Teacher observation.
Arranging parts in an orderly procedure to prevent loss or damage. Selecting the proper type: (a) screwdriver (b) wrench (c) pliers (d) Cutters (e) Fastening devices (f) Washers (f) Washers	Demonstration. Lecture.	Screwdrivers Wrenches Pliers Cutter, etc.	Take notes in notebooks.	Written examination.
Soldering with gun or iron. Stripping wire.	Demonstration.	Old radio Soldering gun and iron Soldering wire Tools for stripping	Practice soldering on old radio chassis provided by instructor. Practice stripping wire.	Teacher observation.
Learning the proper method of using hand tools used in radio repair.	Demonstration.	Screwdrivers Wrenches Pliers Cutters, etc.	Use the tools as demonstrated and practice to become more proficient.	Quiz and observe.
Tinninga soldering iron.	Demonstration.	Soldering iron File Solder	Practice tinning a soldering gun tip or iron.	Teacher observation.

TASK NO. 4: ISOLATING THE DEFECTIVE COMPONENTS IN A PARTICULAR STAGE OF THE RADIO

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Explaining the electron theory of current flow in the radio.	Lecture. Physics teacher may be used if desirable. Film	Charts of the superheterodyne. Film: "The Electron Theory." U.S. Government Films, OE - 34006, borrow from USN.	Make chart of superhet in block form in notebooks indicating flow of current Read text	Written examination
Explaining the function of each stage of the radio.	Lecture. Filmstrips.	Radio - block diagram of the superheterodyne. Filmstrip: "Radio Servicing Series." MGHT - 6 strips, 37 frames each, Educational Media Index 9, McGraw-Hill, p. 154.	Take notes, and keep notebook - starting with a power supply and adding on until superhet is completed in block form Read text View filmstrip	Written objective type exam Check notebooks
Recognizing the various parts of the radio.	Demonstration. Lecture.	Charts and pictures Old radios and spare components Schematics	Practice recognizing components provided by the instructor. Study schematics. Read text.	Test on recognition of parts.
Recognizing the color code of resistors.	Lecture.	Supply of resistors V.O.M. Color code chart	Practice finding the value of resistors provided by instructor. Make color code chart in notebook.	Test on ten or so resistors selected by the instructor.
Computing Ohm's Law to determine amperage, voltage, and resistance.	Demonstration. Lecture. Programed instruction.	Chalkboard Test panel Programmed Lesson: Basic Electricity from A.T.&T.	Place formula in notebook and work problem supplied by instructor.	Check notebooks. Written examination.
Measuring resitance, voltage, and current flow in the different stages of the radio using the appropriate electrical meters.	Demonstration.	V.O.M. - V.T.V.M. Charts - schematics Radio Large panel radio if possible	Practice making readings. Take notes. Read text.	Teacher observation. Quiz.
Interpreting meter readings to determine the condition of the components.	Demonstration.	V.O.M.-V.T.V.M. Charts - schematics Radio Large panel radio if possible	Practice making readings. Take notes. Read text.	Teacher observation. Quiz.
Checking the resistance in a particular stage of a radio with V.O.M.	Demonstration.	V.O.M. V.T.V.M. Schematic Radio	Practice taking resistance readings.	Teacher observation. Quiz.

Task No. 4 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Connecting electrical meter in the proper manner.	Demonstration.	V.O.M. V.T.V.M. Schematic Radio	Practice taking resistance readings.	Teacher observation. Quiz.
Applying the proper care, maintenance and storage of electrical meters.	Demonstration.	V.O.M. V.T.V.M.	Practice caring for meters.	Teacher observation.
Determining the correct method of inspecting, checking, and calibrating electrical meters to known standards.	Demonstration.	V.O.M. V.T.V.M.	Practice calibrating meters.	Teacher observation.
Selecting the appropriate electrical meters for the job to be done.	Demonstration. Lecture.	V.O.M. V.T.V.M.	Take notes. Read text.	Quiz.
Recognizing the importance of proper connections when using electrical meters.	Demonstration.	Radio Meters	Take notes. Read text. Practice connecting meters.	Quiz.
Inspecting the components with meters to eliminate possible causes of trouble until defect is found.	Demonstration.	Radios Meters (V.O.M. - V.T.V.M.). Schematics	Practice making inspection on radios provided by instructor.	Teacher observation.
Reading the manufacturer's service reference for possible causes of trouble.	Demonstration with radio. Lecture.	Trouble shooting charts. Radios.	Practice locating defect from symptoms provided by instructor. Read text.	Written examination. Ditto schematics with components to place or locate.
Reading the manufacturer's schematic to locate the components.	Lecture with students following on schematic.	Schematics	Following on schematics. Take notes. Read text.	Written examination. Ditto schematics with components to place or locate.
Injecting a signal in the proper sequence to isolate the defective stage with a signal generator.	Demonstration. Lecture. Film.	Signal generator Radio (panel type if available). Diagram (block) Schematics Film: "Signal Generator Operation," U.S. Government Films, OE-34006, borrow from U.S.N., Order No. MN 1540-9.	Practice injecting signals in various parts.	Quiz.
Applying the proper safety precautions: (a) Wearing safety shoes with non-conducting soles. (b) Removing jewelry and items of clothing containing metal fasteners. (c) Avoiding work situations where moisture is present. (d) Disconnect the radio from the power supply. (e) Discharging the capacitors of the radio. (f) Properly grounding the radio.	Demonstration. Lecture.	Solder gun and iron Necessary hand tools Misc. components and terminals	Solder connections. Work with related projects to acquire knowledge and gain more experience using tools.	Teacher observation.

TASK NO. 5: REPLACING THE DEFECTIVE COMPONENTS IN A PARTICULAR STAGE OF A RADIO

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting the appropriate meters for the job to be done.	Demonstration. Lecture.	V.O.M. V.T.V.M.	Take notes. Read notes.	Quiz.
Determining the correct method of inspecting, checking, and calibrating meters to known standards.	Demonstration.	V.O.M. V.T.V.M.	Practice calibrating meters.	Teacher observation.
Applying the proper care, maintenance, and storage of electrical meters.	Demonstration.	V.O.M. V.T.V.M.	Practice caring for meters.	Teacher observation.
Recognizing the importance of proper connections of meters. Connecting meters in a proper manner.	Demonstration.	Radio Meters	Practice connecting meters. Take notes. Read text.	Quiz.
Reading the manufacturer's schematic to determine value and location of the components.	Lecture with students following on schematic.	Schematics	Following on schematics. Take notes. Read text.	Written examination. Ditto schematics with components to place or locate.
Measuring the replacement components to determine correct values with the appropriate meters.	Demonstration.	V.O.M. V.T.V.M. Components	Practice making measurements with meters on components supplied by instructor.	Quiz.
Recognizing the results of using pliers for removing nuts and bolts. Applying methods of holding pliers for pulling, pressing, and twisting. Applying the proper methods of holding the work. Selecting the proper type and size of: (a) screwdrivers (b) pliers Applying the proper care, maintenance, and storage of tools. Applying the proper procedures for cutting with diagonal cutters.	Demonstration.	Radio chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in radio repair. Remove and install components.	Teacher observation.
Determining the proper method for stripping wire.	Demonstration.	Length of various size wire (insulated) Wire cutters - strippers	Practice stripping wire provided by instructor.	Teacher observation.

Task No. 5 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Replacing the defective cord or plug.	Demonstration.	Length of parallel wire and plugs Radio	Practice replacing cord and plug on old radios provided by instructor.	Teacher observation.
Removing the defective components from the chassis with a soldering gun and appropriate tools.	Demonstration.	Soldering gun Old radios Diagonal cutters Needle-nose pliers	Practice removing components from old radios.	Teacher observation.
Recognizing the corrosive effects of acid on copper. Recognizing the importance of using only rosin core rosin core solder on electrical connections.	Demonstration.	Acid-core solder Rosin-core solder Soldering iron	Take notes.	Cover on examination covering entire task.
Practice safe working procedures when soldering.	Demonstration.	Radio chassis and soldering gun	Read solder gun manual and practice using safety precautions.	Cover on examination
Exercising care to prevent damage to components with heat when soldering.	Demonstration. Lecture.	Chalkboard Solder gun Radio chassis Hand tools Heat sinks (or alligator clips) Small components	Practice soldering while protecting components from excessive heat.	Cover on examination.
Replacing new components in the circuit with a soldering gun and appropriate tools.	Demonstration.	Radio chassis Hand tools Solder gun Rosin core solder Misc. capacitors and resistors	Practice installing components in old radio chassis.	Cover on examination.

TASK NO. 6: REPLACING THE CHASSIS IN THE CABINET AFTER A FINAL INSPECTION OF THE RADIO

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the various types of fastening devices. Recognizing the various types, uses, and characteristics of the added fasteners. Recognizing the various types and uses of washers. Applying the proper methods of installing threaded fasteners. Recognizing the difference between right and left hand thread.	Demonstration. Lecture.	Assortment of fastening devices Washer Various hand tools	Practice working with the various fasteners on old radios.	Teacher observation. Cover on examination.
Selecting the proper type and size of screwdriver, pliers, cutters, etc.	Demonstration.	Radio chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in radio repair. Remove and install components.	Teacher observation.
Applying the proper procedure for cutting with diagonal cutters.	Demonstration.	Radio chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in radio repair. Remove and install components.	Teacher observation.
Determining the proper method of stripping wire.	Demonstration.	Length of various size wire (insulated) Wire cutters - strippers	Practice stripping wire provided by instructor.	Teacher observation.
Recognizing the results of using pliers for removing nuts and bolts.	Demonstration.	Radio chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in radio repair. Remove and install components.	Teacher observation.
Applying methods of holding pliers for pulling, pressing, and twisting.	Demonstration.	Radio chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in TV repair. Remove and install components.	Teacher observation

Task No. 6 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Applying the proper method to hold work.	Demonstration.	Radio chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in radio repair. Remove and install components.	Teacher observation.
Applying the proper care, maintenance and storage of tools.	Demonstration.	Radio chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in radio repair. Remove and install components.	Teacher observation.
Selecting the proper types and sizes of soldering gun or iron. Recognizing the importance of tinningthe tip of the soldering gun or iron. Determining the correct composition of solders to use on the radio. Recognizing the importance and purpose of flux when soldering. Applying the proper method of transferring heat to work. Selecting the correct solder and flux. Selecting the proper method of applying solder.	Demonstration. Lecture.	Various solders Soldering gun Soldering irons Files - fluxes Old chassis and components	Practice selecting the proper soldering gun or iron, tinning same and soldering using various types of solder and flux. Reading text and taking notes.	Teacher observation. Covered on written examination on entire task.
Practice safe working procedures when soldering.	Demonstration.	Radio chassis Soldering gun	Read solder gun manual and practice using safety precautions.	Cover on examination.
Recognizing the importance of using only rosin core solder on electrical connections.	Demonstration.	Acid-core solder Rosin-core solder Soldering iron	Take notes.	Cover on examination covering entire task.
Replacing all mechanical fasteners using the appropriate tools. Reading the manufacturer's schematic to find the connecting point of the built-in antenna. Soldering antenna lead in place.	Demonstration.	Schematics Soldering gun Solder Nut drivers Screwdrivers Needle-nose pliers	Practice replacing chassis in the cabinet, attaching all fasteners with appropriate tools. Soldering antenna.	Teacher observation.

TASK NO. 7: MAKING FINAL OPERATIONAL CHECKS AND ADJUSTMENTS TO THE RADIO

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Plugging the radio into outlet. Tuning the radio to a local station. Checking for loose connections.	Demonstration.	Radio	Practice to gain experience in locating loose connections.	Quiz. Cover on task 7 exam.
Listening to the radio on a selected frequency to determine performance. Recognizing correct operation from the audio signal.	Demonstration. Lecture. Local service person perhaps useful in this situation.	Radio	Practice on radios that have been tampered with by instructor.	Quiz.
Selecting the proper type and size of screwdrivers.	Lecture.	Assortment of screwdrivers (insulated)	Take notes.	Cover on task 7 examination.
Adjusting trimmer condensers to peak output position with a screwdriver.	Lecture. Use of service person if desirable.	Radio and schematics Chart Signal generator V.T.V.M.	Practice adjusting trimmer condensors using signal generator and meter.	Cover on task 7 examination.
Applying the proper care, maintenance and storage of tools.	Demonstration. Lecture.	Radio chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in radio repair. Remove and install components.	Teacher observation.

TASK NO. 8: OBSERVING THE SYMPTOMS TO DETERMINE THE DEFECTIVE STAGE OF THE TELEVISION SET

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Explaining the characteristics and functions of each stage of the T.V.	Lecture. Service person useful if desired.	Schematics - TV set Transparency - teacher prepared block diagram	Draw a block diagram of a television set and write a description of each in notebook.	Written objective type exam.
Interpreting drawings, specifications, manufacturer's catalogs, service manuals, schematics and handbooks.	Lecture. Discussion.	Schematics Service manuals Handout - circuit symbols	Practice locating information.	Quiz.
Recognizing the audio signal characteristics to localize defects. Recognizing video signal characteristics to localize defects. Determining by visual inspection the defective stage of a television.	Demonstration. Lecture. Classroom TV - bring in local service man if desirable.	Schematics - charts Television set Trouble-shooting charts	Practice recognizing defects "planted" in the television by the instructor. Read trouble-shooting charts and keep notes in notebook.	Written objective type examination, or open-book exam, or performance test.
Visually inspecting for obvious defects in the cord and plug of the television.	Demonstration.	Television set	Inspect cord and plug.	Teacher observation.

TASK NO. 9: CHECKING THE TUBES IN THE SUSPECTED STAGE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading tube chart and tube manual to determine the type and rating of the tube.	Demonstration. Film	Tube tester with chart - manual to tube tester being used Film: "Tube Tester Operation," 9 min., U.S. Government Film, OE-34006, borrow from U.S.N., Order No. NN 1540-P.	Read from text (section covering this topic in text you use). Find tubes and proper ratings on tube tester chart. View film.	Quiz - oral or written. Teacher observation.
Interpreting meter readings of tube tester to determine tube conditions.	Demonstration. Lecture. Use of local service man if possible.	Tube charts Tube tester with manual Tube characteristic manual	Make sample chart in notebooks with tubes provided by teacher.	Check notebook work. Test - oral or written(may be included on task 2 exam). Observation.
Operating a tube tester to determine condition of tubes. (a) Straightening tube pins (b) Removing tubes from chassis (c) Testing for shorts (d) Testing for gassy tubes	Demonstration (use of various tubes. Lecture. Film.	Supply of tubes Tube tester Tube puller Film: "Tube Tester Operation," 9 min., U.S. Government Film, OE-34006, borrow from U.S.N., Order No. NN 1540-P.	Practice testing tubes provided by instructor. Remove and replace tubes in chassis.	Allow students to demonstrate ability to test tubes and care of equipment. Teacher observation. Quiz.
Recognizing the different types of tubes by observation. Recognizing different types of tube sockets. Recognizing different tube testers.	Demonstration. Lecture. Film.	Various types of tubes and sockets Available charts Film: "The Diode Principles and Application," U.S. Government Films, (17 min.), B & W, Order No. OE-176, buy from U.W.F., OE - 34006.	Take notes in notebook. Read in text. Make tube chart with tubes provided by instructor.	Quiz - examine more on task 2 examination.
Interpreting drawings, specifications, catalogs, service manuals, schematics, etc.	Discussion. Lecture.	Schematics Service manuals Handout - circuit symbols	Practice locating information.	Quiz
Explaining the electron theory of current flow in the television.	Lecture. (Outside service person may be helpful if desirable).	Block diagram of a television schematics. Television. Teacher-made overlay (block diagram).	Make block diagram of television with written explanations of each stage. Follow on schematics. Read chapter or section of text in use which covers the information.	Written objective type examination

TASK NO. 10: REMOVING THE CHASSIS FROM THE CABINET FOR EASE IN SERVICING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting the proper type and size screwdriver and nutdrivers. Applying the proper care maintenance and storage of tools. Recognizing the various types of fastening devices. Recognizing the various types, uses, and characteristics of threaded fasteners. Recognizing the various types of washers. Applying the proper methods of removing threaded fasteners. Recognizing the difference between right and left hand thread.	Demonstration. Lecture.	T.V. sets Nutdrivers Screwdrivers Assorted fasteners	Practice working with the tools on "junkers" provided by the instructor.	Cover on task 10 exam (performance exam).
Removing back cover screws. Removing chassis mounting bolts with appropriate tools. Removing knobs from front of set.	Demonstration.	Soldering gun and solder. Nutdrivers Screwdrivers Long-nose pliers Radios	Practice on radios provided by instructor.	Teacher observation.
Arranging parts in an orderly procedure to prevent loss or damage.	Demonstration. Lecture.	Screwdrivers Wrenches Pliers Cutters, etc.	Take notes in notebooks.	Written examination.
Discharging the static charge from the picture tube and high voltage tubes with a screwdriver.	Demonstration. Lecture.	T.V. set Hand tools Test Leads	Practice discharging cathode ray and power rectifier tubes in classroom television set.	Teacher observation.and Cover on task 10 exam.
Applying the proper safety precautions: (a) Safety shoes (b) Removing jewelry (c) Avoiding moisture (d) Disconnecting power (e) Discharging capacitors (f) Grounding television	Demonstration. Lecture. Film.	Film: "Safety Precautions for the Electronics Personnel," 18 min. B & W, Order No. MN 6754, borrow from U.S.N., Catalog No. OE-34006, U.S. Government Films.	Practice correct safety procedures.	Include on task 1 exam.

TASK NO. 11: ISOLATING THE DEFECTIVE COMPONENT IN A PARTICULAR STAGE OF THE TELEVISION SET

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Explaining the electron theory of current flow in the television.	Lecture. (physics teacher may be used if desirable) Film	Chalkboard Diagram	Make chart of superhet in block form in notebooks indicating flow of current. Read text.	Written examination
Explaining the function of each stage of the television.	Lecture. (local service person may be helpful)	Charts - RCA Diagrams (teacher made) Chalkboard Demonstrator	Make a block diagram of a television receiver. Keep notes.	Written examination
Reading manufacturer's service reference charts for possible cause of trouble.	Demonstration. Lecture.	Trouble-shooting charts TV sets	Practice locating defect from symptoms provided by instructor. Read text.	Written examination
Reading manufacturer's schematic to locate components.	Lecture with students following on schematic.	Schematics	Following on schematics. Read text. Take notes.	Written examination Ditto schematic with components to place or locate
Recognizing the color code of resistors.	Lecture.	Supply of resistors V.O.M. Color code chart	Practice finding the value of resistors provided by instructor. Make color code chart in notebook.	Test on ten or so resistors selected by the instructor
Computing Ohm's law to determine amperage, voltage, and resistance.	Lecture. Demonstration. Film.	Chalkboard Test panel Multi-meter Dry cells Resistors (low ohmage) Film: "Ohm's Law," 19 min., Order No. TF 11 - 1200, borrow from Army, Cat. No. OE-34006.	Read text. Do Ohm's Law problems in notebook. List formulas needed.	Written examination
Applying the proper care, maintenance, and storage of meters.	Demonstration.	V.O.M. V.T.V.M.	Practice caring for meters.	Teacher observation
Determining the correct method of inspecting, checking, calibrating meters to known standards.	Demonstration.	V.O.M. V.T.V.M.	Practice calibrating meters.	Teacher observation
Selecting the appropriate meters for the job to be done.	Demonstration. Lecture.	V.O.M. V.T.V.M.	Take notes. Read text.	Quiz

Task No. II (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the importance of proper connections when using meters.	Demonstration.	Radio Meters	Take notes. Read text. Practice connecting meters.	Quiz
Recognizing the importance of discharging capacitors and CRT prior to using a V.O.M. in the circuit.	Demonstration. Lecture.	Television set. Screwdriver. V.O.M. Fuse pullers. Test leads.	Practice discharging capacitors and CRT on set in classroom.	Cover on task II exam Teacher observation
Identifying the difficult components and their designated values.	Demonstration. Lecture.	Television set. Schematics. Spare parts. Meters.	Practice identifying components and reading values according to existing codes and schematics.	Written examination
Practicing safety precautions while working with live circuits.	Lecture. (Ideal situation for use of local serviceman)	TV set Insulated tools	Practice safety measures while adjusting live set. Read and keep notes.	Cover on task II exam
Inspecting the electrical components with appropriate electrical meters to eliminate the possible cause of trouble until the defective component is found.	Demonstration.	T.V. set. Meters (V.O.M., V.T.V.M.) Schematics	Practice making inspection on television provided by instructor.	Teacher observation
Interpreting meter readings to determine conditions of components.	Demonstration.	V.O.M. V.T.V.M. Charts Schematics TV Large panel TV if possible	Practice making readings. Take notes. Read text.	Teacher observation Quiz
Checking the wave forms with an oscilloscope.	Demonstration. Lecture.	Oscilloscope TV set Screwdriver Test Leads Demodulator probe Schematics	Practice checking wave patterns. Compare good and defective sets.	Examination Teacher observation

TASK NO. 12: REPLACING THE DEFECTIVE COMPONENTS IN A PARTICULAR STAGE OF THE TELEVISION

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a schematic to determine values and locations of components.	Lecture with students following on schematic.	Schematics	Following on schematics. Take notes. Read text.	Written examination Ditto schematic with components to place or locate
Recognizing the color code of resistors.	Lecture.	Supply of resistors. V.O.M. Color code chart	Practice finding the value of resistors provided by instructor. Make color code chart in notebook.	Test on ten or so resistors selected by the instructor.
Applying the proper method of holding the work.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in television repair. Remove and install components.	Teacher observation.
Selecting the proper type and size: Screwdriver Cutters Pliers Nutdrivers	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in television repair. Remove and install components.	Teacher observation
Applying methods of holding pliers for pulling, pressing, and twisting.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in television repair. Remove and install components.	Teacher observation
Recognizing the results of using pliers for removing nuts and bolts.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in television repair. Remove and install components.	Teacher observation
Selecting the proper types and sizes of cutters. Applying the proper procedures for cutting with diagonal cutters.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in television repair. Remove and install components.	Teacher observation.
Recognizing the various types of fastening devices.	Demonstration. Lecture.	Assortment of fastening devices Washers Various hand tools	Practice working with the various fasteners on old TV's.	Teacher observation

Task No. 12 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the various types, uses, and characteristics of threaded fasteners.	Demonstration. Lecture.	Assortment of fastening devices Washers Various hand tools	Practice working with the various fasteners on old TV's	Teacher observation
Recognizing the various types and uses of washers.	Demonstration. Lecture.	Assortment of fastening devices Washers Various hand tools	Practice working with the various fasteners on old TV's.	Teacher observation
Applying the proper methods of installing threaded fasteners.	Demonstration. Lecture.	Assortment of fastening devices Washers Various hand tools	Practice working with the various fasteners on old TV's.	Teacher observation
Recognizing the difference between right and left hand thread.	Demonstration. Lecture.	Assortment of fastening devices Washers Various hand tools	Practice working with the various fasteners on old TV's.	Teacher observation
Determining the proper method of stripping wire.	Demonstration. Lecture.	Various solders Soldering gun Soldering irons Files - fluxes Old chassis and components	Practice selecting the proper soldering gun or iron, tinning same and soldering using various types of solder and flux. Reading text and taking notes.	Teacher observation - covered on written examination on entire task.
Applying the proper care, maintenance, and storage of tools.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in TV repair. Remove and install components.	Teacher observation

Task No. 12 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting the proper types and size of soldering gun or iron. Selecting the proper tips for same. Recognizing the importance of tinning the tip of a gun or iron. Determining the correct composition of solder. Recognizing the importance of using flux. Applying the proper method of transferring heat. Selecting the proper solder and flux. Selecting the proper method to apply solder.	Demonstration. Lecture.	Various solders Soldering gun Soldering irons Files - fluxes Old chassis and components	Practice selecting the proper soldering gun or iron, tinning same and soldering using various types of solder and flux. Reading text and taking notes.	Teacher observation - covered on written examination on entire task.
Removing the defective component from the chassis with a soldering gun and tools.	Demonstration.	Soldering gun Old TV Diagonal cutters Needle-nose pliers	Practicing removing components from old TV's.	Teacher observation
Replacing the new components in the chassis with soldering gun and tools.	Demonstration.	TV chassis Hand tools Solder gun Rosin core solder Misc. capacitors and resistors	Practice installing components in old TV chassis.	Cover on examination
Replacing the defective cord and/or plug.	Demonstration.	Lengths of parallel wire and plugs TV	Practice replacing cord and plug on old TV's provided by instructor.	Teacher observation

TASK NO. 13: REPLACING THE CHASSIS IN THE CABINET AFTER THE FINAL INSPECTION OF THE TELEVISION SET

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting the proper type and size: Screwdriver Levels Pliers Nutdriver Pullers Hammer Wrenches Chisel Cutters Punches	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in TV repair. Remove and install components.	Teacher observation
Applying the proper method of holding work.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in TV repair. Remove and install components.	Teacher observation
Applying methods of holding pliers for pulling, pressing, and twisting.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in TV repair. Remove and install components.	Teacher observation
Recognizing the results of using pliers for removing nuts and bolts.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in TV repair. Remove and install components.	Teacher observation
Applying the proper procedure for cutting with diagonal cutters.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in TV repair. Remove and install components.	Teacher observation
Determining the proper method of stripping wire.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in TV repair. Remove and install components.	Teacher observation

Task No. 13 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Recognizing the various fastener devices. Recognizing the types and uses of washers. Applying the proper method of installing threaded fasteners. Difference between right and left threads. Recognizing the types, uses, and characteristics of threaded fasteners.	Demonstration. Lecture.	Assortment of fastening devices Various hand tools	Practice working with the various fasteners on old TV's.	Teacher observation Included on final examination of tasks
Applying the proper care, maintenance, and storage of tools.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in radio repair. Remove and install components.	Teacher observation.
Observing safe working procedures when installing a chassis.	Demonstration. Lecture.	TV set Hand tools	Practice replacing chassis using appropriate tools.	Cover on task 13 exam. Teacher observation.
Selecting solder gun or iron. Selecting tips for same. Recognizing the importance of tinning the tip. Determining the correct composition of solder to be used. Recognizing the importance of using flux. applying the proper method of transferring heat to work. Selecting the correct solder and flux. Selecting the proper method of applying solder.	Demonstration. Lecture.	Various solders Soldering gun Soldering irons Files - fluxes Old chassis and components	Practice selecting the proper soldering gun or iron, tinning same and soldering using various types of solder and flux. Reading text and taking notes.	Teacher observation - covered on written examination on entire task
Reading the manufacturer's schematic to determine the connecting points for mounting screws and bolts.	Demonstration.	TV schematics	Practice locating fasteners on schematics.	Cover on task 13 exam.

Task No. 13 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Replacing the chassis in the cabinet using the appropriate tools.	Demonstration. Lecture.	TV set Hand tools	Practice replacing chassis in the television cabinet.	Cover on task 13 exam.
Soldering antenna leads in place with a soldering gun.	Demonstration.	Nutdrivers Screwdrivers Needle-nose pliers Schematics Soldering gun Solder	Soldering antenna.	Teacher observation.

TASK NO. 14: MAKING FINAL OPERATIONAL CHECKS AND ADJUSTMENTS TO THE TELEVISION SET

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Interpreting drawings, specifications, manufacturer's catalogs, service manuals, schematics, and handbooks.	Discussion. Lecture.	Schematics Service manuals Handout - circuit symbols	Practicing locating information.	Quiz.
Plugging the television into the service outlet. Tuning to a local channel.	Demonstration.	TV set	Practicing tuning to a given channel.	Teacher observation.
Adjusting the horizontal and vertical synchronization to eliminate black edges, and to center the picture.	Demonstration. Lecture.	TV set Screwdrivers Service manuals Mirror	Practice adjusting controls for best possible picture.	Cover on examination covering entire task.
Recognizing correct operation of the television from audio and vidio pe-formance.	Demonstration. Lecture.	TV set	Practice tuning for best results.	Teacher observation.

TASK NO. 15: INSTALLING AN OUTDOOR TELEVISION ANTENNA AND TRANSMISSION LINE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting the proper type and size of: Screwdrivers Cutters Pliers Nutdrivers Wrenches	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in TV repair. Remove and install components.	Teacher observation
Recognizing the proper method of holding wrenches.	Demonstration.	Assortment of wrenches	Practice using wrenches.	Teacher observation
Applying methods of holding pliers for pulling, pressing, and twisting.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in TV repair. Remove and install components.	Teacher observation
Recognizing the results of using pliers for removing nuts and bolts.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in TV repair. Remove and install components.	Teacher observation
Applying the proper procedure for cutting with diagonal cutters.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in TV repair. Remove and install components.	Teacher observation
Recognizing the various types of threaded fasteners.	Demonstration. Lecture.	Assortment of fastening devices Washers Various hand tools	Practice working with the various fasteners on old TV's.	Teacher observation Included on final examination of task
Recognizing the various types, uses, and characteristics of fasteners.	Demonstration. Lecture.	Assortment of fastening devices Washers Various hand tools	Practice working with the various fasteners on old TV's.	Teacher observation Included on final examination of task
Recognizing the various types and uses of washers.	Demonstration. Lecture.	Assortment of fastening devices Washers Various hand tools	Practice working with the various fasteners on old TV's.	Teacher observation Included on final examination of task

Task No. 15 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Applying the proper method of installing threaded fasteners.	Demonstration. Lecture.	Assortment of fastening devices Washers Various hand tools	Practice working with the various fasteners on old TV's.	Teacher observation Included on final examination of task
Recognizing the difference between right and left hand threads.	Demonstration. Lecture.	Assortment of fastening devices Washers Various hand tools	Practice working with the various fasteners on old TV's.	Teacher observation Included on final examination of task
Interpreting the manufacturer's instructions for assembling antenna.	Demonstration. Lecture.	Manuals	The class could install an antenna of its own or for someone.	Cover on task 15 exam.
Determining the proper method of stripping wire.	Demonstration.	Length of various size wire (insulated). Wire cutters - strippers.	Practice stripping wire provided by instructor.	Teacher observation.
Utilizing 300-ohm twinlead ribbon wire wherever possible for connecting the antenna to the receiver. Recognizing that antenna lead should be as short as possible to receiver.	Demonstration.	Twinlead Diagonal cutters Wire stripper	Read section of text being used dealing with antennas.	Cover on task 15 exam.
Applying the proper method of holding the work.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in TV repair. Remove and install components.	Teacher observation
Installing the antenna near a line-of-sight broadside to the transmitter using the appropriate tools.	Demonstration.	Antenna or Electronic Aid Equipment to demonstrate	Let students turn antenna and witness results on CRT.	Cover on task 15 exam.

Task No. 15 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Mounting the lightening arrestor to provide a high resistance discharge path for static charge with correct tools. Grounding the mast to prevent accumulation of static charge with correct tools. Rotating the antenna to the position that results in the best picture.	Demonstration. Lecture. (service person from business may be used here)	TV antenna Ground wire 300 Ohm wire	Practice and observe the installation of an antenna using the appropriate tools. Mounting the lightning arrestor and grounding the mast.	Cover on task 15 exam. Teacher observation
Applying the proper care, maintenance and storage of tools.	Demonstration.	TV chassis Various screwdrivers and pliers Wire cutters Diagonal cutters Components Soldering gun and solder	Practice using the various small hand tools used in TV repair. Remove and install components.	Teacher observation
Determining the resonant length of an antenna.	Demonstration using Electronic Aid Equipment or other teaching device (i.e. Leecher Line)	E.A. modules necessary to set up xmitter and receiver or Leecher Line	Set up receiver and xmitter and experiment with various antenna lengths (if available). Read antenna section of text.	Examination - written
Attaching necessary guy wires or cables to stabilize the mast.	Demonstration.	Wire with necessary tools and attachments.	Practice installing guy wires.	Teacher observation

OCCUPATIONAL INFORMATION FOR RADIO AND TELEVISION SERVICING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Employment outlook: 1. Local 2. National	Lecture. Use of local service person or someone from employment office.	Government pamphlets and publications. Employment charts in various electronic areas (public address, radio, TV, etc.) from EIA, 2001 I Street, N.W., Washington, D.C.	Read publications. Check with local employment office. Writing for information: U.S. Department of Labor, Washington, D.C.	Written examination. Discussion. Teacher observation.
Wage scale: 1. Local a. union b. non-union 2. National a. union b. non-union	Lecture. Union representative if one is available in local area. Guest speaker.	Publication: "Employment and Earnings Statistics for the United States," Government Printing Office, Department of Labor, Washington, D.C. Teacher-prepared charts.	Write National Union: 1126 16th Street, N.W., Washington, D.C. 20036. Read publications. Check locally.	Quiz - oral or written. Discussion.
Types of training available: 1. Apprentice programs. 2. Technical or trade schools. 3. On-the-job. 4. Military.	Lecture. Guest speaker from technical school. Union representative if available, local recruiter - local employer may all be useful.	Publications and catalogs from various technical schools or junior colleges; military handbooks most of which are available in the school guidance department.	Read publications and catalogs. Listen to speakers. Write for information. Check with recruiter.	Written examination. Discussion.
Working conditions experienced in the occupation.	Lecture. Service person ideal here. Field trips.	Pictures. Local shop. Local servicemen.	Talk with people in the trade.	Quiz. Discussion.
Physical and mental characteristics needed to qualify for employment.	Lecture. Talk by experienced serviceman.	Local servicemen	Listen to lecture.	Cover on examination. Discussion.
The geographical location of employment.	Lecture.	Electronic Industries Association, 2001 I Street, N.W., Washington, D.C.	Listen to lecture.	Cover on examination. Discussion.
Opportunity for advancement.	Lecture. Local employer as guest speaker.	Local employer.	Listen to speaker. Check local employment opportunities. Write companies.	Quiz. Discussion.

OCCUPATIONAL INFORMATION UNIT FOR RADIO AND TELEVISION SERVICING (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Advantages and disadvantages of the occupation.	Lecture.	Publication: "Job Guide for Young Workers," U.S. Government Printing Office, Department of Labor, Washington, D.C. (published each year).	Read "Government Job Guide." Talk with people in the trade.	Quiz. Discussion.
The nature of the work involved in the occupation.	Lecture. Serviceman as guest speaker. Field trip.	Publication: "Job Guide for Young Workers," U.S. Government Printing Office, Department of Labor, Washington, D.C. (published each year. Local serviceman. Local shop.	Read available information. Listen to lecture. Attend field trip.	Quiz. Discussion.
The union involvement in the occupation.	Lecture. Union representative if available in your area or teacher-directed discussion.	Publication: "Directory of National and International Unions in the United States," U.S. Government Printing Office, Washington, D.C. Local union representative.	Write Local Union Office or National Headquarters: 1126 16th Street, N.W., Washington, D.C. Check locally.	Quiz.

INSTRUCTIONAL MATERIALS LIST

FOR

THE ELECTRO-MECHANICAL INSTALLATION
AND REPAIR CLUSTER

AIR CONDITIONING AND REFRIGERATION SERVICING

Books

Althouse, A.D. and Turnquist. Modern Refrigeration and Air-Conditioning. Homewood, Illinois: Goodheart-Willcox Publishing Company. 1961.

Burkhardt, D.H. Residential and Commercial Air-Conditioning. New York: McGraw-Hill Publishing Company. 1959.

Films

"Principles of Refrigeration"
16mm, sound, b&w, 20 minutes
Visual Instruction Bureau
University of Texas
Austin, Texas

"Mechanical Refrigeration:
How It Works"
16mm, sound, b&w, 22 minutes
Norwood Films
926 New Jersey Ave. N.W.
Washington 1, D.C.

"Basic Electricity"
16mm, sound, color, 30 minutes
Order #GTG-3
Carrier Air-Conditioning Company
Syracuse, New York

"Lifting, Man's Age Old Problem"
16mm, sound, color, 13 minutes
Film Supervisor
Aetna Life & Casualty
Hartford, Connecticut 06115

Filmstrips

"Adding or Removing Refrigerant"
52 fr., b&w
Norwood Films
926 New Jersey Avenue, N.W.
Washington, D.C.

"Basic Principles of Refigeration"
71 fr., color, sound
Communicable Disease Center
Atlanta 22, Ga.

Pamphlets

"Man on the Firing Line"
(booklet on service etiquette) - $ .30 #GTG-1
Carrier Air Conditioning Company
Syracuse, N.Y. 13201

BUSINESS MACHINE SERVICING

Books

Jones, Clarence Leroy. Typewriter Mechanical Training Manual. Downers Grove, Illinois: Ames Supply Company. 1945.

Manuals

Order manuals as required from each manufacturer.

Olivette-Underwood Corporation
#1 Park Avenue
New York, N.Y.

Remington Rand Office Machines
1051 So. Main Street
Elmira, N.Y. 14904

Royal Typewriter Company, Inc.
150 New Park Avenue
Hartford, Connecticut

Smith Corona Corporation
Parts Department
500 E Street, S.W.
Washington, D.C.

HOME APPLIANCE SERVICING

Books

"ABC's of Hand Tools," The. Detroit, Michigan: General Motors Corporation. 1945.

Brockwell, Percy T. Major Appliance Servicing. New York: McGraw-Hill Publishing Company. 1958.

Crouse, William H. Electrical Appliance Servicing. #6729A. Scranton, Pennsylvania: International Correspondence Schools. 1965.

Darr, Jack. How to Repair Small Appliances. Indianapolis: Howard W. Sams & Company, Inc. 1962.

Gay, James A., Jr. Reliable Electrical Connections. #SP-5002. Technology Handboob published by NASA. George C. Marshall Space Flight Center: Huntsville, Alabama. 1963.

Manly, H. P. How to Repair Electrical Appliances. (Book 2). Chicago: Frederick J. Drake & Company. 1964.

Stephens, Arthur. Simplified Electrical Appliance Servicing. Chicago: Simpson Electric Company. 1966.

Tricomi, Ernest. How to Repair Major Appliances. Indianapolis: Howard W. Sams & Company, Inc. 1966.

Films

"Basic Electricity - The Electron Theory"
16mm, sound, 5 minutes
Encyclopedia Britannica Films
65 E. South Water St.
Chicago 1, Ill.

"Elements of Electric Circuits"
16mm, sound, b&w, 11 minutes
Encyclopedia Britannica Films
65 E. South Water Street
Chicago 1, Ill.

"Electromagnets"
16mm, sound, b&w, 10 minutes
McGraw-Hill Book Company, Inc.
330 West 42nd St.,
New York, N.Y. 10036

"Electrons"
16mm, sound, b&w, 10 minutes
Encyclopedia Britannica Films
65 E. South Water Street
Chicago 1, Ill.

"Home Electrical Appliances"
16mm, sound, b&w, 11 minutes
Encyclopedia Britannica Films
65 E. South Water Street
Chicago 1, Ill.

"Introduction to Electricity"
16mm, sound, b&w.
Coronet Films
Willmette, Ill.

"Magnetism"
16mm, sound b&w, 16 minutes
Encyclopedia Britannica Films
65 E. South Water Street
Chicago 1, Ill.

"Measurement of Electricity"
16mm, sound, b&w
Coronet Films
Willmette, Ill.

"Nature of Heat"
16mm, sound, b&w, 10 minutes
Coronet Films
Willmette, Ill.

"Modernizing Motors"
16mm, sound, color, 19 minutes
Dow Corning Corporation
8555 16th St.,
Silver Spring, Md.

"Lifting, Man's Age Old Problem"
16mm, color, sound, 13 minutes
Film Supervisor, Information and
Education Department
Aetna Life & Casulty
Hartford, Conn. 06115

Filmstrips

"Understanding Electricity"
(7 filmstrips - color), series #1210
The Jam Handy Organization
2821 E. Grand Boulevard
Detroit, Mich. 48211

RADIO AND TELEVISION

Books

ABC's of Servicing, The. #4-4. Washington, D.C.: National Radio Institute. 1965.

Dictionary of Electronic Terms. #IX-4. Washington, D.C.: National Radio Institute. 1967.

Herrington, Donald E. How to Read Schematic Diagrams. #RSD-1. Indianapolis: Howard W. Sams & Company. 1962.

Levy, Alex, and Murray Frankel. Television Servicing. New York: McGraw-Hill Publishing Company. 1959.

Marcus, William, and Alex Levy. Practical Radio Servicing. New York: McGraw-Hill Publishing Company. 1956.

Films

"The Printed Circuit Story"
16mm., sound, color, 25 minutes
Bray Studios, Inc.
729 Seventh Avenue
New York 19, N.Y.

"Volt Ohmmeter Operation"
16mm,, sound, b&w, 15 minutes
Norwood Films
926 New Jersey Avenue, N.W.
Washington, D.C.

"Ohm's Law"
16mm., sound, b&w, 19 minutes
U.S. Army
TF11-1200
Cat. No. OE-34006

"Safety Precautions for the Electronics Personnel"
16mm., sound, b&w, 18 minutes
U.S. Navy
MN 6754
OE-34006

"Tube Tester Operation"
16mm., sound, b&w, 9 minutes
U.S. Navy
MN-1540-P
Cat. No. OE-34006

"Signal Generator Operation"
16mm., sound, b&w
U.S. Navy
MN-1540-9
Cat. No. OE-34006

"The Electron Theory"
16mm., sound, b&w
U.S. Navy
MN-8016-a
Cat. No. OE-34006

Filmstrips

"Radio Servicing Series"
(6 strips), b&w
McGraw-Hill Textfilms
330 W. 42nd Street
New York 36, N.Y.

Charts

"Block Diagram of Radio Receiver"
(34 x 22)
Howard W. Sams and Company
Indianapolis, Indiana

"Block Diagram of T.V. Receiver"
(34 x 22)
Howard W. Sams and Company
Indianapolis, Indiana